THE IRON AGE

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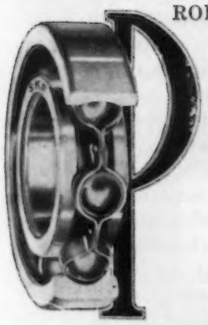
Condition of Material Watched Closely in Ball Bearing Manufacture



PRODUCTION of anti-friction bearings involves not only very accurate workmanship, but also close control of materials to assure uniform hardness and homogeneity of structure in the finished product. And, both of these must be obtained under mass production conditions.

In ball bearings, close accuracy of balls and races assures even distribution of the load, while uniform hardness and sound structure of material maintains the properly distributed loading initially secured by accurate workmanship.

So that in the manufacture of such bearings frequent inspection of dimensional accuracy, form and finish must be paralleled by a more or less extensive system of material tests at strategic points before and after heat treatment.

At the Hartford plant of the S. K. F. Industries, Inc., these material tests begin with the receipt of the bars, tubes and other raw material, and are made at various stages of manufacture, up to the final assembly. Except for chemical tests and examinations under the microscope, these inspections are for the most part by means of hardness tests. In addition, magnetic test of each piece for homogeneity of structure is made immediately after hardening.

The larger part of the output is self-alining ball bearings ranging from ¾ to 24 in. outside diameter. Smaller and larger ball bearings are also produced, as well as cylindrical roller and special bearings. At this plant also is made, in a separate shop, ball-bearing drop and post hangers and split and solid pillow blocks. The balls are received ready for assembly from the company's Atlas Ball Co. plant in Philadelphia, so that the making of races, cages and rollers and assembling the parts into finished bearings are the main activities of this plant.

Material Inspected Before Being Admitted to the Shop

Races for bearings up to 6 in. are made from a steel similar to S.A.E. 52100 and having 0.95-1.05 per cent carbon, 1.40-1.65 per cent chromium and 0.25-0.40 per cent manganese, with sulphur 0.020 and phosphorus 0.025 per cent. The chromium and carbon contents cause a maximum penetration of the effect of heat treatment and develop a high degree of hardness. Rolled bars and seamless tubes are used for the races of bearings up to 6 in. outside diameter, and forgings of a special composition are used for larger bearings.

A sample of every heat of steel received, and in some cases samples of every bar and tube of a particular heat, is tested chemically. Then before being admitted to the first production department, which may be several days or weeks later, each bar and tube undergoes another test. A sample is sawed from each end of the bar or tube, and both the bar and samples given an identification number. One sample goes directly to the laboratory for a Brinell test; the other is sent to the hardening room and later forwarded to the laboratory for examination under the microscope—porosity, segregation, slag and other defects being looked for. Until approved by the laboratory the steel is not admitted to the manufacturing department. Bars and tubes which show surface defects are given a light surface cut in a bar lathe to determine depth of defects.

Automatic Lathe Department

The first race manufacturing unit is the automatic lathe department, the races receiving their initial machining on Acme and Gridley automatics. The inner and outer race is made from the same bar, and operations include turning the outside diameter, drilling the center hole, trepanning, and forming the ball groove on the outside of the inner race. "Sphering" of the outer race is done on special machines. Before proceeding through the shop all races are marked by means of steel stamps carried in punch presses.

Large rings are turned, grooved, faced and chamfered on 16 and 24-in. Fay automatics.

Having been rough and finish turned and formed, the races are inspected for size and visually for condition of material. They then proceed in a straight line to the hardening room, the point of major control of the materials.

Hardening Room Equipped With New Furnaces

This hardening room, recently reequipped, contains three gas-fired continuous furnaces having automatic temperature and mechanical control, and is provided throughout with recording pyrometers.

The furnaces are built of brick, suitably incased and have the gas burners located along the sides. One of them is 10 ft. long and 3 ft. wide and is provided with an alloy steel shaker hearth, which is 15 in. wide and has flanges on the side to keep the work in line. At the charg-

ing end there is a 4 ft. long loading table. The hearth is moved forward at high velocity and returned at low velocity by means of a cam, the rate of movement being adjustable to suit the needs of the work being treated. The work is preheated at the forward end of the furnace. The steel parts are heated to 1480-1560 deg. Fahr., according to physical properties desired. Drawn at 350 deg. Fahr., the Brinell hardness of the steel is about 650.

A steel chute extends from the discharge end of the furnace into a quenching tank. This tank, 10 ft. long, 4 ft. high and 5 ft. deep, is equipped with a conveyor which carries the work through the oil quenching medium and finally elevates it to another conveyor which connects with a washing machine. The oil in the tank is kept agitated by means of a motor-driven propeller.

The two other furnaces are of similar construction, but larger, one of them being 18 ft. long and the other 20 ft. long, both of them 4 ft. wide. A feature of these is the conveyor hearth, which consists of a series of alloy-steel rollers set close together and driven from the outside of the furnace sides by means of chain and sprockets. The rolls thus individually revolved pass the work through the furnace. Provision is made for regulating the rate of roller rotation, and therefore the heating time-interval, to suit the particular requirements of the work being treated.

Quenching Tanks Equipped with Fire Extinguishers

Conveyor-equipped quenching tanks also adjoin these furnaces. Quenching oil temperature is held automatically to about 110 deg. Fahr. by means of pipe coils within the tanks. When the oil is too warm, cold water circulating through the tanks brings down the temperature; when the oil is too cool, the flow of cold water is cut off automatically. Fire extinguishing apparatus in the form of a chemical blanketing spray that is released automatically through the melting of fusible links is provided for all quenching tanks. This fire extinguishing chemical is contained in a receptacle above each tank and is sprayed through nozzles located along the sides of the tanks.

From the quenching tanks, the parts are conveyed to the washing machine, also of continuous type, which removes loose scale and quenching oil, the washed races and other parts dropping out into a basket which is later placed in a Leeds & Northrup Homo tempering furnace. There are two of these furnaces, one for low temperature work, the other for high temperature; the latter is used for high-speed steel, when necessary, as well as for the low temperature work. No carburizing is done except on special work.

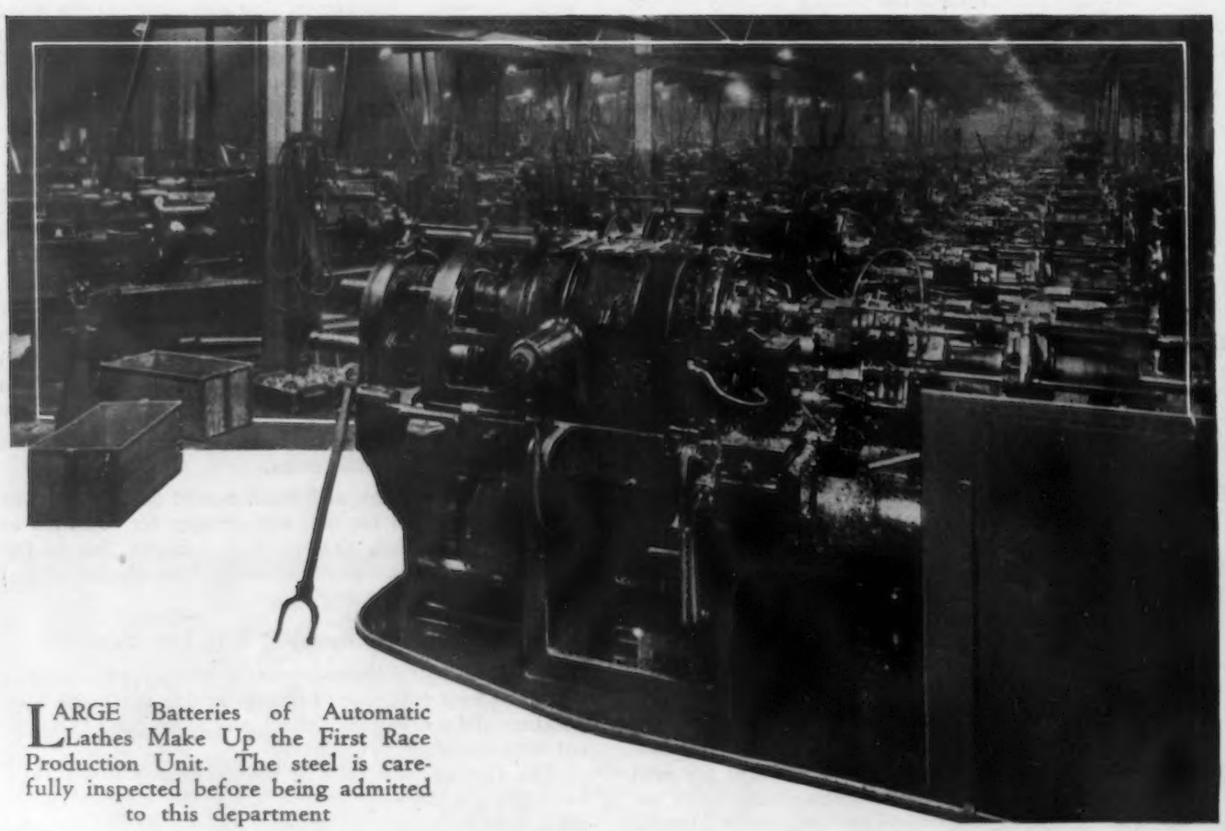
Having been heat-treated, the rings or races go to the sand blasting room, which is equipped with two large rotary outfits and, for thin rings, one table-type sand blast. Here, as well as elsewhere in the works, good plant housekeeping, meaning cleanliness and good order, is noteworthy.

Die cast brass and bronze retainers are sand blasted to improve finish. They are then pickled in the same department to remove sand from the pockets.

Tool Hardening Room

Adjoining the hardening room there is the blacksmith shop and tool hardening room, which is equipped with a number of small furnaces and a carburizing furnace, all of which are gas fired and have automatic temperature control. One furnace in this battery has three heating chambers, one above the other. From a burner in the lower chamber, heat is "ported" to the upper chambers in such a manner that with the lower chamber heated to 2400 deg., the upper chambers will be maintained at 1600 and 1100 deg., respectively. Thus work may be preheated in the middle chamber, heated for quenching in the lower, and drawn after quenching in the upper chamber.

Immediately after hardening, washing and sand blast-



LARGE Batteries of Automatic Lathes Make Up the First Race Production Unit. The steel is carefully inspected before being admitted to this department

SPECIAL Machines Have Been Devised to Facilitate Grinding the Grooves in the Inner Race. In common with other departments of the plant, careful attention has been given to proper illumination

ing, the parts go to an inspection bench where they are tested for hardness and for structure on a special magnetic tester, which is one of the outstanding pieces of special testing equipment in the plant.

This instrument is calibrated to "master" races of known hardness and structure. It should be noted that the various hardness tests—Brinell, Rockwell and Sclerescope—made in different parts of the factory during production serve to check one another.

From these tests, the hardened and tempered races go to the grinding department, which, as might be expected, is well equipped for rapid roughing and for highly accurate finishing operations. Equipment includes Blanchard surface grinders, semi and full-automatic, for grinding the width, the work being held on magnetic chucks. The work is taken from these machines by belt conveyors to washing machines that remove the grinding sludge, being demagnetized before entering the washer.

The races are then tested for size on automatic width or height testers which represent another ingenious labor-saving production testing unit recently developed at this plant. At this point the rings are given another hardness test by means of a Sclerescope arranged for rapid operation.

Adjoining this department there is a battery of centerless grinders for rings of all sizes except some of the largest, and also center type grinders for larger rings ground on arbors.

There are also special semi-automatic bore grinding machines and special machines for grinding the grooves in the inner race. The sphere of the outer race of small ball bearings is also ground on special machines, the operator tending one rough and one finish grinder, both machines being equipped for automatic gaging. Bores are tested with flat gages, solid plugs not being used. All grinding machines are equipped with size gages, some of which are integral with the grinders.

Although finish grinding gives an excellent surface, the inner and outer races are polished to remove grinding marks and give maximum finish. A visual inspection is made after polishing to assure elimination of all grinding marks. Both before and after polishing the rings are checked for size.

At this point there is a special check of the grooves being square with the bore and parallel with the sides, and an optical inspection for the purpose of locating surface flaws and grinding defects.

With the above operations completed, the races are taken to the parts stock room, to be withdrawn on order for assembly.

Rejected parts in each department, as well as rejected finished bearings, are recorded by the inspectors, and reported to the factory manager each day. These reports set forth the specific shortcomings of each piece. Rejections due to defective material are taken up with the metallurgical department; those due to defective grinding are referred to the head of the grinding department, etc., the factory manager discussing the cause of the defective parts with department heads each day. However, the conditions responsible for the rejections are usually rectified

long before the department head is called to account, word being passed to the department head by the inspectors as soon as the spoiled parts make their appearance.

Ball bearings are assembled in one department, while thrust and roller bearings are made up in another, both drawing on the central parts stock room. Although unique special equipment has been devised to facilitate assembling these bearings, the process requires skill, and operators are carefully selected and trained for this job.

After assembly the bearing is given a final inspection, the bore, outside diameter and other dimensions being carefully checked. It is to be noted that the assembled precision ball bearing is required to be from 0.0002 to 0.0005 in. in all significant dimensions. Every bearing is put on an arbor and given a running test, as well as being checked for concentricity, and parallelism of face and rings. This department uses Prestometer fluid gages and other types of gages, for the most part special.

Sphere Grinding Department of the Hartford Plant of the S.K.F. Industries. The sphere of the outer race of small ball bearings is ground on special machines equipped for automatic gaging

Returned Goods Department Inspects All Parts of Bearings

In order to keep the stock of parts and finished bearings unvitiated—that is, of known accuracy and condition—a special department has been established to receive all bearings returned from users because of alleged deficiencies, wrong size, etc. Whatever the reason for return, all parts of such bearings are examined and reported on before being sent to stock, salvaged or scrapped. This department, although very small, is important.

Although the precision nature of such bearings would seem to be widely appreciated, either ignorance or gross carelessness in handling or mounting is reflected in many of the "disabled" bearings that pass through the Returned Goods Department. Entrance of dirt and grit within the bearing, the foreign matter being ground between the balls and prematurely wearing out the races, is perhaps the most common cause of failure. The unwrapping of bearings and leaving them upon a bench exposed to dirt and grit for hours, or placing of bearings upon a dirty bench or table from which they pick up all sorts of foreign matter, are not rare practices. Equally common, perhaps, is the failure to protect the bearings by a cover of clean paper or cloth when closing up of the assembly must be deferred. Dirty grease from the hands of workmen is sometimes a source of trouble also.

And there are errors of fit. Too loose a fit permits harmful peening action between the bearing bore and the shaft; too tight a fit expands the inner rings and destroys the necessary clearance between the balls and races. Hand scraping the bearing seats (producing out-of-roundness) instead of boring, reaming or grinding the seat to size, is a harmful practice met with. Putting an anti-friction bearing on a worn shaft, resulting in too loose a fit, and shimming the housing instead of boring it to receive a bushing, are among other abuses that shorten the life of such bearings and bring to naught the careful manufacture and constant inspection outlined in this article.

Mill Rolls Large Aluminum Shapes

Alloying, Heat Treatment and Aging Gives Material Physical Properties Comparable with Those of Mild Steel—Channels Rolled Up to 14 In.

ALUMINUM, in the popular mind, is associated with kitchen utensils, light castings and architectural decoration. Known chiefly for its uses in small ways and being soft, light in weight and comparatively high in price, this metal has not been commonly thought of as a potential competitor of rolled steel in heavy construction work. Yet aluminum has now definitely entered the lists as a construction material, not merely for special applications such as aircraft fabrication, but in fields in which steel has been unchallenged, such as the building of railroad cars, ships, automobiles and machinery.

An aluminum structural mill rolling channels up to 14 in., as well as other shapes and flats, squares and rounds, was put into service by the Aluminum Co. of America at Massena, N. Y., in November, 1929. By alloying the aluminum, heat treating it and aging it, a material is produced that has physical properties comparable with those of mild steel. The shapes are recommended particularly for uses where a saving in dead weight is important. For example, the use of aluminum alloy structural members in railroad cars reduces the amount of power required to haul them. The lighter weight of the metal also tends to offset the higher cost as compared with steel.

The specific gravity of aluminum alloy is about one-third of that of steel, but to compensate for much lower elasticity a given shape in the non-ferrous metal must have greater thickness. On this account the net saving in weight is reduced to about one-half.

The new Massena plant is an L-shaped group of structures, containing 70,000 sq. ft. of floor space. It includes a remelting and ingot casting unit, a blooming mill and a finishing mill. The structural mill, with its auxiliary equipment, occupies a single building 95 x 900 ft.

Pig aluminum is melted in four coke-fired furnaces. Coke is brought into the building in hopper cars and discharged into a conveyor which elevates it to an overhead hopper. Hatches in the bottom of the hopper are opened by hand levers to draw coke into buggies spotted below. The buggies are rolled to the firing doors.

Ingot Molds Heated Before Receiving Metal

The furnaces have a capacity for melting 20,000 lb. of pig aluminum. The melting temperature is controlled by pyrometric equipment with indicating meters, furnished by the Wilson-Maeulen Co., New York. Ingot molds must be heated to the same temperature before they receive the molten metal. The alloying elements are introduced into the furnace and are not added afterward in the ladle.

Three different sizes of ingots are made, one 12 x 12 x 72 in., weighing 1000 lb.; a "bath tub" type, 12 x 22 x 70 in. and weighing 2200 lb.; and a large slab type, 15 x 28 x 72 in., weighing 3000 lb. These are the largest aluminum rolling ingots ever cast.

The smallest ingot molds are heated in a row of five pits. The fuel is crude oil, burnt under air pressure, and temperature control is by pyrometers. A monorail is used to bring ladles to the pits. Extreme care is exercised to avoid oxidation. The heated ingot mold is raised to the top of the pit and the metal is poured slowly, with a minimum of agitation, into a chalice feeding a tube extending to the bottom of the mold cavity. As an added precaution a deoxidizing flux is added. The pouring temperature is 1300 to 1400 deg. Fahr., and a reading is obtained by inserting a Pyod temperature indicator into the molten metal in the mold.

Controlled Freezing Prevents Formation of Pipe

By regulating the temperature of the pits the freezing of the ingots is controlled, the gases in the aluminum being released gradually and the formation of pipe being prevented. Freezing takes an hour to an hour and a half. The control of the freezing is obtained by slowly lowering the mold from the upper levels of the pit where the oil burners are located into a zone of water sprays. The lowering is substantially automatic. The mold is suspended by a cable which is carried over to vertical hydraulic apparatus arranged to release the cable at the predetermined rate that will bring the entire mold finally at the right time totally within the water cooled bottom of the pit.

Two other mold-heating furnaces have been provided, one for bathtub ingot molds and the other for slab ingot molds. These molds are heated 60 to 90 min. prior to pouring. To remove a hot mold the top of the furnace is removed and crane hooks are lowered and fitted on ears projecting from the mold walls. The mold is then placed in pouring position on a buggy in a pit close to the melting furnaces. Pouring is slow, and after the mold is filled dross is skimmed off. A cable, actuated by a lever within convenient reach of the pouring position, pulls the buggy a short distance from the furnace into a freezing pit. This unit is also fired in the upper reaches by crude oil under air pressure, while water sprays are forced against the mold in the lower levels, controlled freezing being obtained in manner like that described for the smaller molds. The melting room is commanded by a 7½-ton Alliance overhead electric crane.

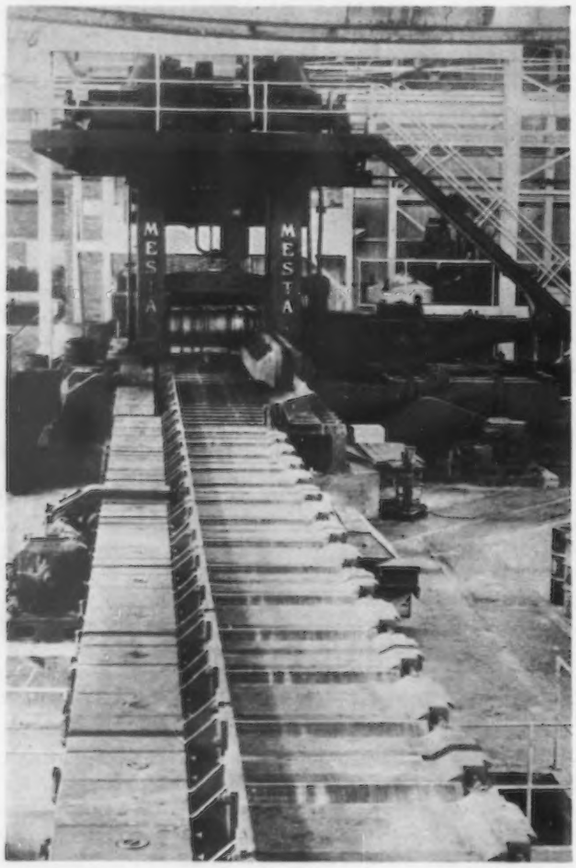
The removal of ingots to the adjoining blooming mill building is by electric lift truck. For conditioning ingots, corresponding to the chipping of billets in a steel mill, a large Betts boring mill has been provided. A Cincinnati hydromatic double grinder dresses blooms and billets. In a bay adjoining this equipment are two large roll lathes. The company has its own roll designers and roll turners and its own guide designers and guide turners.

A 7½-ton Alliance overhead electric crane commands the dressing equipment and the ingot storage and preheating department. A 50-ton overhead crane, also an

Alliance, serves the roll lathes, the blooming mill stand and the motor room.

Ingots Heated in Electric Soaking Pits

Ingots are taken from storage and inserted in a Swindell electric preheating furnace with 14 pits. The battery requires 3000 kw. Pyrometric and control equipment is on a gallery above. The temperature of each pit is taken at several points, indicating and recording pyrometers giving a continuous record. A battery of 14 automatic temperature regulators controls the pit temperatures within any



The Blooming Mill Is the Largest Aluminum Rolling Mill in the World

desired range. Beneath the operating platform of the furnace are electrical contactors that turn the power on and off at each pit. Control of temperature is within an accuracy of 10 deg. Fahr.

The roofs of the pits are lifted off by a Brosius 4-ton electric traveling crane. The 7½-ton Alliance crane removes the ingots, which are heated to a temperature of 850 to 950 deg. Fahr., and delivers them to the blooming mill approach table.

Largest Aluminum Rolling Mill in the World

The blooming mill, built by the Mesta Machine Co., West Homestead, Pa., is the largest aluminum rolling mill in the world, having 38-in. diameter x 84-in. face rolls. Various types of rolls are used. While the writer was present a 12 x 12 x 72-in. ingot was rolled down to a 6 x 6-in. billet. Plates and slabs are also rolled, sheet slabs being rolled down to 2½ and 1 in., in widths ranging from 63 to 79 in., with a maximum length of 230 in.

The mill has a direct electrical drive and is served by hydraulically operated manipulators. Controls are centralized in a pulpit above the approach table directly in front of the mill, two men handling all operations.

The mill motor is a 5000-hp. direct-current, variable-speed reversing unit. Power is supplied to the mill motor by a motor generating set consisting of a 6600-volt alternating-current, 4000-hp. induction motor directly connected with two direct current generators. A flywheel, 16 ft. in diameter and weighing 70,000 lb., is mounted on the motor shaft. The motor operates at 520 r.p.m. and the rim of the flywheel travels at 26,000 ft. per minute. The flywheel, which is of special construction to withstand the great strains set up by the high peripheral speed, acts as a balance between the motor and generators of the motor generator set and takes care of the large fluctuations in current required in operating the mill motor. The Allis-Chalmers Mfg. Co., Milwaukee, supplied the motor and the motor generating set.

No Mill Scale Produced in Rolling

The spindle speed of the blooming mill is 150 r.p.m. Reversing from 150 r.p.m. to 0 takes only 6 sec. A light lubricating oil is flushed over the mill rolls during operations, as a lubricant rather than a coolant. In contrast with the rolling of steel, the rolling of aluminum alloy produces no mill scale.

Billets are delivered by roller table to a Mesta hydraulic shear, which has electrically operated depressing and push off tables and an electrically operated gage for measuring the length of cut. Lengths are sheared up to 220 in. Sheared billets are inspected and then hoisted by an Alliance overhead crane and conveyed to a Fairbanks track scale for weighing. Material to be rolled down into shapes is moved on narrow-gage railroad cars. Other forms of semi-finished metal are loaded for shipment to other rolling units in adjacent buildings or to plants of the company in other cities. Sheet bars, for example, are shipped to the company's sheet mill at Edgewater, N. J.

Structural Mill Has Four Stands

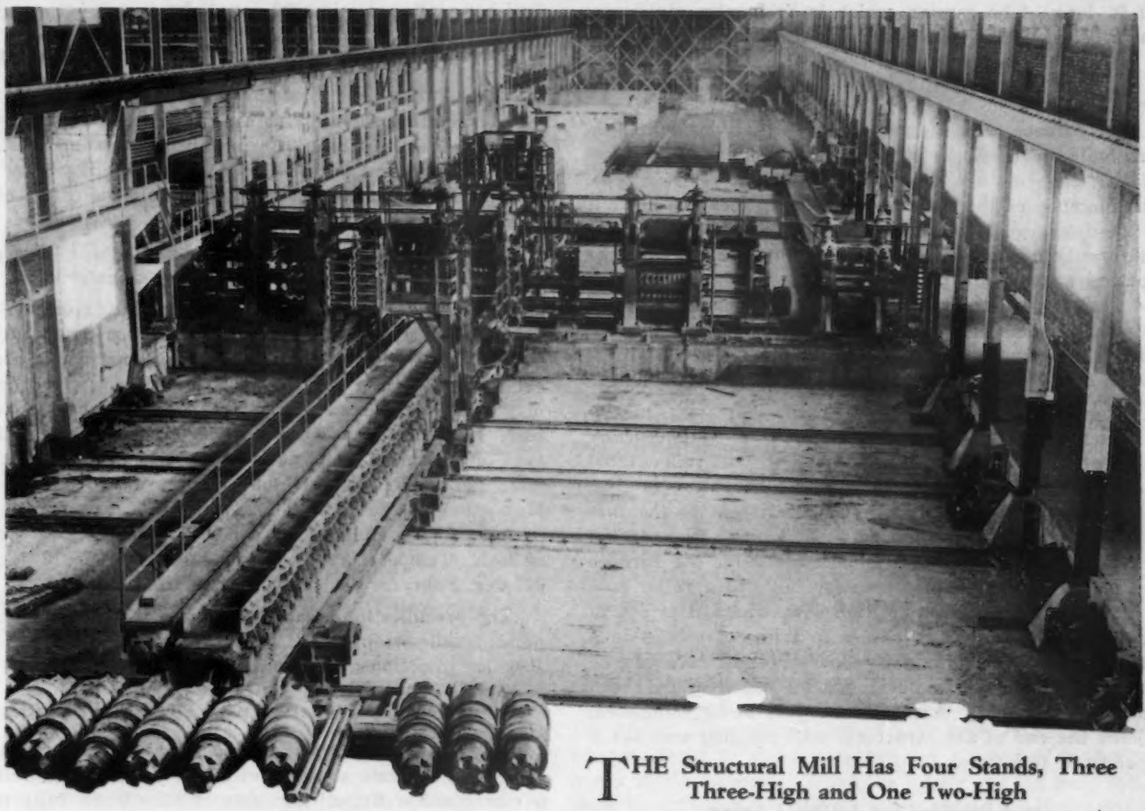
In the structural mill building semi-finished metal is passed through a pusher type oil-heated reheating furnace. Material is carried through to the discharge side by a conveyor, being deposited on a roller table connected with the first stand of the structural mill. There are four stands, the first three being three-high with rolls 26 in. in diameter by 60-in. face and the last being two-high with 26 x 48-in. rolls. Tilting and trailer tables, mounted on transfer tables, serve all four stands.

The mill was built by the Mackintosh-Hemphill Co., Pittsburgh, and is driven by a 2000-hp., 600-volt, direct-current, variable-speed motor. Direct current, in this case also, is obtained from a motor generator set. The spindle speed of the mill is 100 r.p.m.

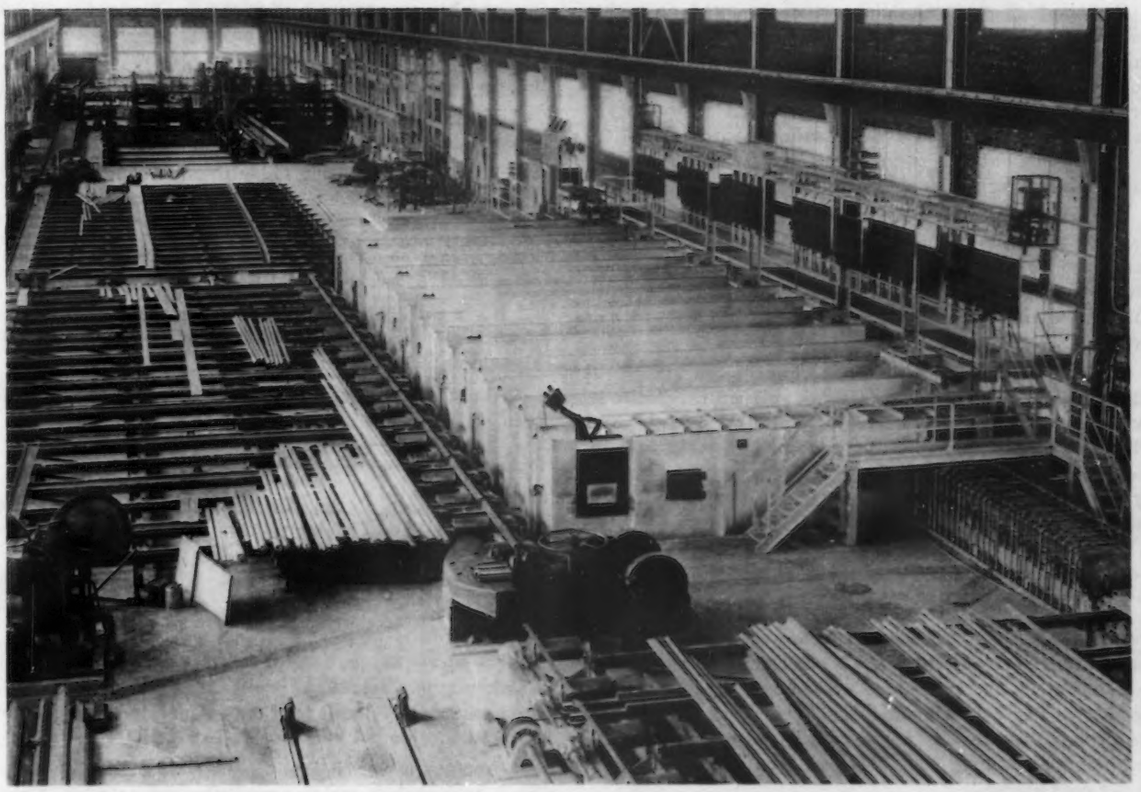
An unusual feature of the operations is that the finished shape as it issues from the last stand is momentarily held down on the table rollers by a stick held by a workman. In contrast with steel, aluminum alloy is so light that if this precaution were not taken the structural shape might not respond to the traction of the rollers.

From the mill the finished material goes to a Ryerson high speed friction saw and a United Engineering gag press. This equipment is used for material that does not require heat treatment. The gag press is used also to straighten shapes to be treated that might be too crooked to pass through the heat-treating furnace. After passing saw and press the material is delivered to a hot bed.

Material to be treated is moved across the bed, which



THE Structural Mill Has Four Stands, Three Three-High and One Two-High



STRUCTURAL Shapes Are Heat Treated in a Long Electric Furnace. They are then quenched, passing through high-pressure water sprays (at extreme left). The quenched shapes are passed by transfer to the gag press (middle foreground), after which they are carried across a transfer (to the left of the furnace) to a roller table serving a shear

consists of I-beams with top layers of wood, to a carrier 90 ft. long. The carrier, which is driven by continuous chain belt, conveys the shapes into the heat-treating unit.

Shapes Heat Treated and Quenched

The furnace, which is more than 90 ft. in inside length, was built by the Electric Furnace Co., Salem, Ohio. The heating elements are the cast grid metallic resistor type. Lift fingers pick the stock up from the carrier and move it to the discharge table on the opposite side of the furnace. Uniformity of temperature is maintained throughout the working area. The furnace is divided into 26 zones, and the temperature in each is separately controlled by an automatic temperature regulator and is indicated and recorded by pyrometric equipment. A temperature differential of 10 deg. Fahr. is maintained throughout the working area of the furnace.

After being heat treated, each piece is automatically quenched, being carried by a motor-driven roller table through high-pressure water sprays. The piece is then passed by transfer to a roller table adjacent to the furnace, where it is straightened by a United Engineering gag press. It is then passed back alongside the furnace and moved across another transfer table to a roller conveyor serving a Ryerson friction saw, where it is cut to length. From the saw it passes to a line of rollers on a scale, where the weighing is done. Freight cars can be run alongside so that material can be loaded by overhead crane for shipment. A warehouse, just being completed, adjoins the end of the structural mill building and has a capacity of four cars.

Oven Provided for Artificial Aging

Certain high-strength alloys must be aged at higher than room temperature. For this purpose an aging oven, which can receive shapes up to 90 ft. in length, has been provided. Structural shapes are handled in and out of the oven by specially constructed, standard-gage railroad-type cars. The metal is aged under steam, which is circulated evenly throughout the oven by electric fans. Recording thermometers permit close control of the temperature.

The structural mill is commanded by a 10-ton Alliance overhead traveling crane built of high-strength aluminum plates and angles, riveted. Load tests on the crane indicate that it compares favorably in strength and rigidity with a similar crane fabricated from steel, but with a saving in weight of 24,000 lb.

Typical sections seen by the writer in the structural mill included 10-in. ship channels, 8-in. structural channels, 6 x 4-in. angles, 5 x 3½-in. angles and 4-in. Z-bars. The mill also rolls flats up to 10 in. wide and from ¼ to 3 in. thick, and rounds 3½ to 8 in. in diameter. The web and leg thicknesses of the shapes rolled vary according to the specifications of customers.

Shapes Rolled Mainly from Three Alloys

Structural shapes are rolled largely from three alloys: 17-S, 25-S and 51-S. The first two are copper alloys, 17-S containing 4 per cent copper, 0.5 per cent manganese and 0.5 per cent magnesium and 25-S containing 4.5 per cent copper, 0.8 per cent silicon and 0.8 per cent manganese. The designation 51-S is for a metal that is almost pure aluminum, containing only 0.6 per cent magnesium and 0.1 per cent silicon.

The copper alloys when cast contain a hard, brittle compound—$Cu Al_2$—in the form of a network. This compound contains 54 per cent copper and surrounds the aluminum-rich dendrites. Rolling breaks down this network and heat treating puts it into solution. Quenching holds the $Cu Al_2$ in solution. Heat treating is very near the eutectic temperature, which in the case of alloy containing 5.65 per cent copper is 1020 deg. Fahr.

Advantages of Solution Heat Treatment and Aging

The solution heat treatment is described as follows: (1) Heating the alloy to the proper temperature for a sufficient length of time to bring about the solution of the soluble constituents, and (2) quenching the alloy after the solution has been effected in order to hold the constituents in solid solution.

By this treatment the yield point, tensile strength, hardness and elongation may be increased materially.

The next step, aging or precipitation heat treatment, is described as a low temperature treatment to precipitate in submicroscopic form the soluble constituents which are in solid solution as a result of heat treatment. The aging may take place at room temperature or at a higher temperature. In the latter cases it is termed "artificial" aging. This type of treatment is provided for in the aging oven. Care must be taken that the temperatures employed are not high enough to place the alloy in the annealing range. In such a case the effect of the solution heat treatment would be lost. Temperatures in the oven are held at 212 deg. to 347 deg. Fahr. for various periods of time.

The precipitation treatment further increases the yield point, tensile strength and hardness of the alloy but at the sacrifice sometimes of elongation.

How Heat Treatment Affects Physical Properties

The alloy 17-S, when annealed, has a yield point of 10,000 lb., ultimate strength of 26,000 lb., elongation of 20 per cent and a Brinell hardness of 45. When fully tempered (aged) the same alloy has a yield point of 35,000 lb., an ultimate strength of 58,000 lb., elongation of 20 per cent and a Brinell hardness of 100.

The alloy 25-S, when annealed, has the following properties: Yield point, 10,000 lb.; ultimate strength, 26,000 lb.; elongation, 20 per cent, and Brinell hardness, 45.

When fully tempered, 25-S has the following properties: Yield point, 35,000 lb.; ultimate strength, 58,000 lb.; elongation, 20 per cent, and Brinell hardness, 100.

The alloy 51-S, when annealed, has properties as follows: Yield point, 5500 lb.; ultimate strength, 16,000 lb.; elongation, 30 per cent, and Brinell hardness, 28.

When fully heat treated, 51-S has the following properties: Yield point, 35,000 lb.; ultimate strength, 48,000 lb.; elongation, 14 per cent, and Brinell hardness, 95.

All of these are typical values, rather than guaranteed.

Alumina Reduced by Electrolysis

The location of the Massena plant was determined by the availability of water power. A power canal connects the St. Lawrence River with the Grasse River and the falls at the junction generates 75,000 hp. in electrical energy. About 60,000 hp. additional is bought from Canadian plants.

The electricity is used to reduce alumina by electrolysis to aluminum. No bauxite is treated at Massena, all the ore used by the Aluminum Co. of America being chemically reduced to alumina at East St. Louis, Ill.

Alumina to be reduced is introduced into an iron pot lined with carbon, which constitutes the cathode. Cryolite, obtained from Greenland, is added to serve as the electrolyte or solution agent and a carbon anode is then lowered into the solution. About 0.8 lb. of the carbon anode is consumed for 1 lb. of aluminum made. The power consumption to produce a pound of aluminum is approximately 15 hphr.

Steel Castings in Green Sand

Care Needed in Mixing the Sand and in Gating the Mold —Venting, Feeding Heads and Pouring Carefully Considered

BY PAUL R. RAMP*

TO produce sound, smooth steel castings in green sand molds, which will stand up under pressure and be reasonably free from pin holes, blow-holes, sand holes and shrinkage cracks, several things must be carefully considered: character of sand used; facing sand mixture; mixing and care of the heap sand; pattern making, venting, gating, size and location of feeding heads; use of gaggers and rods and the method of pouring.

The sand should be similar to Ottawa silica sand, or New Jersey silica sand. It should be coarse enough to allow the gas to escape from the mold freely, and with silica content not under 96 per cent.

Facing mixture for green sand work may be made of

Silica sand (without natural bond)	500 lb.
Bentonite	6 qt.
Corn flour binder	1 qt.

This facing must be used next to the pattern and around the gates. The moisture in the facing must be from 3½ to 4 per cent. To mix the facing properly, place the silica sand and the correct percentage of bentonite in the mixer first and mix them thoroughly. Add the required amount of corn binder and mix 3 min. before adding water. After the water is added mix another 5 min.

When the sand is ready to be removed from the mixer take a moisture test. If the moisture is over 4 per cent add more dry sand and remix. If the moisture is below 4 per cent add water and remix. The moisture content is very important and must not be neglected at any time.

When facing is ready for use it must be loaded into a bin or box and covered, to prevent it from drying out.

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Facing under 4 per cent moisture is very hard to work, because it crumbles under the tools. Use 2 in. of facing sand on patterns and around gates.

Heap Sand Characteristics

Heap sand consists of used or burnt facing sand. Hence, to start a green sand heap, all of the sand must first be facing sand. Heap sands containing a percentage of natural bond sand must not be used, if we want to get the best results.

The heap sand must be mixed as carefully as the facing sand. When the green sand molds are poured and shaken out all of the sand must be carried to the mixer and milled for 5 min. after all the lumps have been crushed. Corn binder should be added at a ratio of 1 quart of binder to every 500 lb. of sand. When the binder and the heap sand have been thoroughly mixed, water must be added until a moisture of not over 3 per cent has been secured. The moisture must be determined before the heap sand is removed from the mixer.

Heap sand should be used as soon as it is mixed, to have the proper moisture. It is desirable to have the moisture higher in the facing sand than in the heap sand, because a damper facing will produce a better surface on the mold. If it is too dry it will crumble under the tool and cannot be properly finished.

It is desirable to have the heap sand with a lower percentage of moisture than the facing sand, because, when this is the case, the surface of the mold dries quickly, which is what is necessary. But if the heap sand has a higher moisture content than the facing sand, the surface of the mold will not dry so readily on account of the

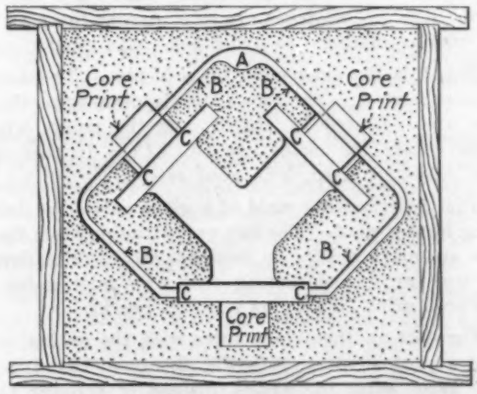


Fig. 1—Gating for Mold of a Y-Connection, with Basin of Downgate at *A*, Gates Proper at *B*, *B* and Inlet Gates at *C*, *C*

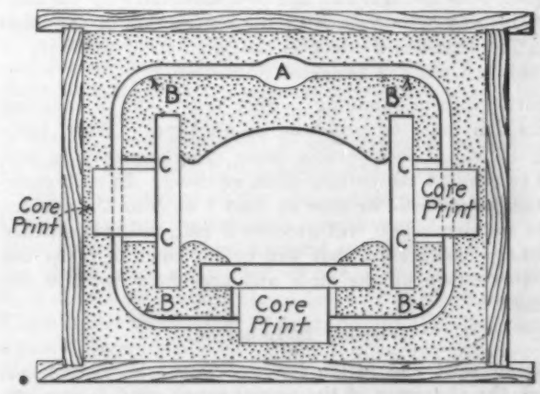


Fig. 2—Gate Arrangement for Globe Valve Mold. Letters have the same meanings as in Fig. 1

higher moisture in the heap sand behind it. In such cases there is always danger of a cut scab or rough surface on the castings, or sand holes. The moisture should never be guessed at.

All patterns should have a smooth surface and several coats of good shellac, because green sand facing clings to any rough surface on the pattern and produces rough places and a surface that will not peel when the casting is taken out of the sand. It is true the rough places produced by the rough pattern can be slicked smooth with the tool. But, with a facing of this character, the surface repaired with the tool will not peel nor produce a casting as smooth as the surface that is properly rammed and does not require any slicking. For this reason, a smooth pattern with plenty of draft is very important in producing smooth steel castings with this green sand facing.

Ramming the Mold

Care must be exercised in ramming. The idea which seems to prevail, that a steel molder can ram just as hard as he cares to without any bad results, is wrong. All molds must be rammed snugly around the outer edge—the part that forms the joint—but more softly and uniformly over the pattern and between flanges. Soft ramming between the flanges of pipes or valves reduces the danger of cracks, by allowing the casting to contract.

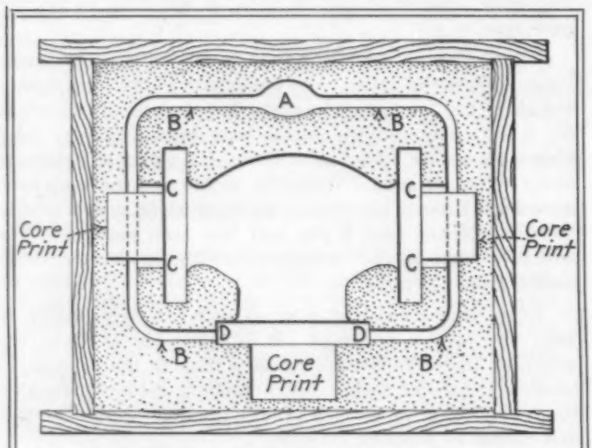


Fig. 3—Another Gating Plan for a Globe Valve Mold. Additional inlet gates are shown at *D*, *D*

When a mold is rammed too hard the flanges or projections, such as lugs, etc., are held stationary by the hard mold, instead of moving with the contraction of the casting. The result is a crack at the junction of the body of the castings and the flange or projection.

Soft, uniform ramming is very important in reducing cracks and must be practised at all times. When ramming a mold of considerable depth it is necessary to ram hard to prevent the casting from swelling. In such cases the ramming should be done at least 5 in. from the surface of the pattern. This will produce a soft, uniform surface with hard background that will be sufficient to resist the excessive strain on the mold and prevent a swell in the casting.

Venting Is Important

Green sand and molds for steel must be vented, although the character of the proper green sand facing and heap sand makes it possible to produce many small steel castings without venting, because the sand is coarse and open enough to allow the gas to escape. But in cases where the molds must be rammed hard, or backed up by hard ramming, the mold must be well vented to avoid scabs and cuts on the surface of the casting. These will be produced if the gas does not escape freely.

The harder a mold is rammed the closer the grains of sand are packed together. Consequently, there is little chance for the gas to work through the sand without the help of vent passages.

In ramming deep molds it is advisable to lay vent rods within a few inches of the pattern while ramming the mold, allowing one end of the rods to extend through the vent holes in the flask, so they can be drawn out after the ramming is completed. This plan provides a free and positive escape for the gas, and is much more reliable than passages produced by a vent wire after the mold is rammed. A vent wire can, however, be used in many cases where there is not any danger of the gas not getting off quickly by its use.

Gating Should Be at Bottom

Whenever possible a mold should be gated at the bottom, so the metal will enter the mold at the bottom instead of at the joint or some other point higher up. In making bottom pouring gates a dry sand gate core should be used. The advantage of the bottom gate is that it allows the metal to flow into the mold softly, which reduces the wear on the surface of the mold. The bottom gate in many cases prevents blow-holes, because there is less danger of air traps when the metal rises uniformly from the bottom.

To run light castings, lower the end of the mold where the gate is located enough to compel the metal to run up a slight incline. This plan keeps the metal traveling in a body, which causes it to remain liquid longer than when it is level, or tipped the other way.

Whenever possible all gates should be formed by the use of set gates, rather than to cut the gates after the patterns are drawn, because the set gate or molded gate will withstand the wear of the metal better than a cut gate, regardless of how well it is slicked. And it is easier thus to regulate the size and shape of the gate than when it is left to the molder's judgment.

Gating must at all times be carefully studied. The metal must enter the mold as softly as possible, to prevent excessive wear on the surface of the mold or washing away of delicate points of the mold. The metal must enter the mold at as many points as possible, to avoid hot spots, which result in shrinkage cracks.

When gating a mold on the joint, if possible have the metal from the inlet gate enter the mold directly under a feeding head. This will prevent a burn-down and brings the hottest metal into the feeding head when the mold is filled. The five sketches are to represent the plan of gating similar castings, to avoid hot spots, cracks, etc.

Fig. 1 is the drag mold for a Y-pipe. The down-gate is located at *A*. The two gates leading from the down-gate are indicated by *BBBB*, and the points where the metal enters the molds are *CCCCCC*. In this case six inlet gates are used, with good results.

Fig. 2 is the drag mold of a globe valve, the down-gate being located at *A*. The two gates leading from the down-gate are marked *BB*. In this case the *B* gates flow under the core prints, connecting with two inlet gates *CC* at each core print. This plan prevents cracks.

Fig. 3 is another globe valve with the gating arrangement almost identical with Fig. 2, except that two of the inlet gates enter the flange, instead of through the core print. This plan is all right if the flange is not too heavy. In such cases the gates should be in the core print.

Fig. 4 is the drag mold for an angle valve. The same plan is carried out here, except that there is no inlet gate

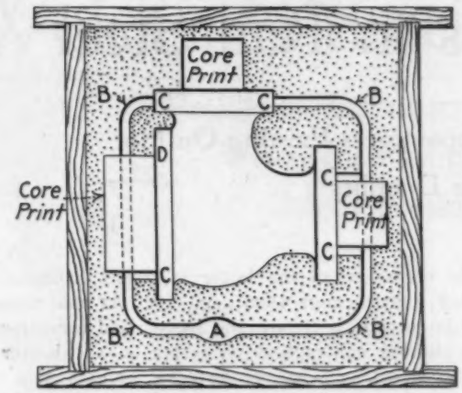


Fig. 4—Angle Valve Mold Gating Plan. Here, again, the designating letters are as in Fig. 1

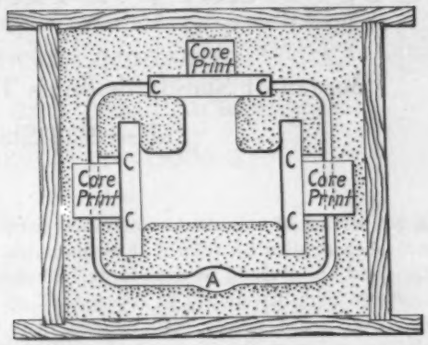


Fig. 5—Gating Plan for Cast Steel Tee Pipe, with Gates, etc., Designated as before

at *D*. This gate is eliminated because, at *D*, there is a heavy section and, if the metal were permitted to enter at this point, a bad hot spot would be created and a crack would be the result.

Fig. 5 is the drag mold for a Tee pipe. This mold is gated the same as Fig. 3. The whole plan is to distribute the metal and not allow it to enter the mold at one place, when possible, and in the production of pipes and valves this is possible. There are many larger castings and castings of different design for which one gate is necessary. But at all times the question of how the metal is going to cool should be considered when making a gate for a steel casting mold.

Feeding Heads Must Keep Metal Hot

Feeding heads must be large enough to remain liquid longer than the casting they are feeding, when possible. They should be the same diameter at the riser pad as they are at the top end, to keep the metal hot where it enters the mold. Riser pads consist of an extension of the pattern where the feeding heads are placed. They should be attached to all patterns used for steel molding, whenever feeding heads are required. They form the connection between the feeding head and the mold and this connection can be more correctly made in the pattern shop, rather than have the molder cut the connection with a tool.

Feeding heads should be connected with the mold at the highest point, whenever possible, and always be large enough to remain liquid long enough to feed properly.

When several patterns are used in a flask, they must be located in a manner which will allow sufficient room for side-feeding heads and gates, to avoid trouble locating them when the cope is placed on, ready for ramming. A good plan is to place the feeding head patterns in the drag with the patterns, when locating the patterns.

The gates on the large molds will be on the bottom of the green sand molds. This plan leaves the hottest metal at the bottom of the mold, when it is filled, and the hottest metal should be at the top. To have the hot metal at the top, pour the mold through the bottom gates until it rises to the feeding heads; then switch the pouring from the gate to the risers. At this time there will be no danger of dirt being carried into the mold, as it is already full of metal. For the same reason, there will be no danger of wear on the mold from top pouring. But by the time the feeding heads are filled the hottest metal will be at the top for feeding purposes.

Green Sand Cores for Pipes

A cast steel pipe will not crack so readily if a green sand core is used instead of a dried core. There are many cases where a complete green sand core cannot be used, on account of the trouble to carry it, etc. In many of these cases the bottom half of the core can be made in dry sand, and the upper half in green sand, the lower half acting as a support for the upper green half. This upper half should be made out of the standard green sand facing mixture, as should all green sand cores.

When the bottom half of a core is made and dried, and used as a support for the upper half, provision must be made for holding the core down. This should be done by the use of a metal stool extending from the upper surface of the lower dry half through the green half to the surface of the green half, where it can be held down with a chaplet through the cope.

Explains Peculiar Case of Rusting Plates and Rivets

The heavy rusting of plates and rivets was discovered in a fairly new steamer. This was investigated and the results are discussed in the November, 1929, issue of *Korrosion und Metallschutz*. According to the author, M. Rudolph, damage to rivets is not unusual, caused frequently by the continuity of the coat of rustproof paint becoming broken. In this particular case the severe corrosion, extending in parts to a depth of 3 mm. (⅛ in.), was peculiar.

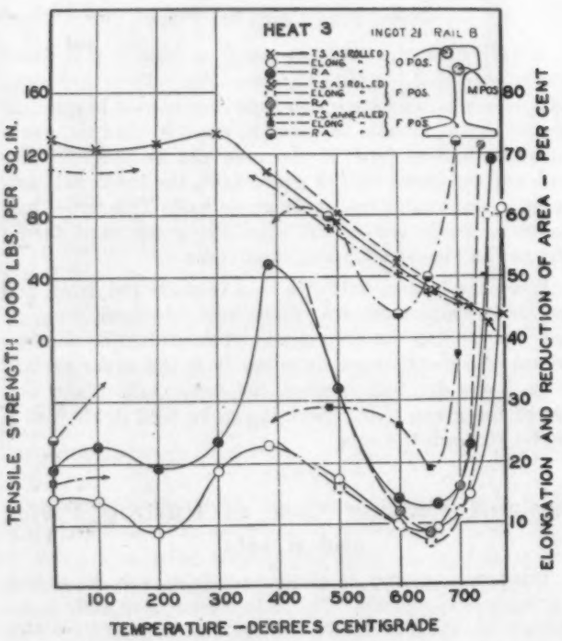
The composition of the plates was normal; they contained, however, considerable quantities of oxidized slag inclusions, and these set up local galvanic action in which the plates acted as anodes. Further, the corroded plates were found to contain blowholes just under the surface. These hinder the passage of heat through the plate; minute stress differences are set up, and the warmer part becomes less "noble" than the colder parts, and suffers attack. When the corrosion penetrates to the blowholes, matters become even worse; the sea water fills the holes, but oxygen cannot reach them, so that a difference in aeration is set up, causing corrosion of the parts which the oxygen cannot reach. The unattacked plates contained less slag inclusions and no blowholes.

Secondary Brittleness in Rail Steel

Bureau of Standards Finds That At Temperatures Existing On Hot Bed Rail Steel Has Little Ductility

TENSILE properties of rail steel at elevated temperatures have been studied by John R. Freeman, Jr., and G. Willard Quick of the Bureau of Standards. They note a region of reduced ductility at 500 to 700 deg. C., in addition to the blue brittle range (around 200 deg. C.). Typical results are given in the accompanying illustration taken from their paper, "Tensile Properties of Rail and Other Steels at Elevated Temperatures," delivered at the February convention of the American Institute of Mining and Metallurgical Engineers.

This so-called secondary brittleness is present (though in varying degree) in all steels tested, including rails of various history, hypereutectoid steel and Armco iron. An



Physical Properties of Specimens Taken From 100-Lb. Rail Made Under Standard American Practice, When Tested in Tension at Somewhat Elevated Temperatures

excessive amount of secondary brittleness is apparently a property of the heat as a whole, and is suppressed in part by annealing either below or above the transformation. It does not seem to be related to chemical analysis, nitrogen content, silica, alumina or manganese. Test pieces breaking at 600 deg. C. and thereabouts show the characteristic brittle fractures, and the cracks appear to follow the grain boundaries.

On the supposition that this inferior ductility in hot metal might be the cause of the well known "shatter cracks" in rail heads, the authors constructed temperature-time curves of rails, at the surface, midpoint and center, during cooling at various rates of speed. Even when cooling in still air the surface is about 150 deg. C. cooler than the center when the latter is passing through the secondary brittle range (600 deg. C.). At that time the surface is set into a strong and more rigid condition, unyielding to the contraction occurring in the hotter and more brittle center. In the authors' opinion this could explain the formation of shatter cracks in rails, which in turn are supposed by many to be the nuclei of transverse fissures. They therefore recommend a slow cooling for rails and other massive steel parts at such a rate that the center and surface are within a relatively few degrees of each other at all times.

In the discussion, Robert Job, vice-president Milton Hersey Co., Montreal, Canada, reviewed the present state of opinion on transverse fissured rails, emphasizing the fact that their occurrence is very sporadic, and then only after the rail has been under traffic. In other words, a heat of a rail steel may have a predisposition toward transverse fissures, but the fissures themselves do not exist when leaving the mill. Dr. H. W. Gillett, director Battelle Memorial Institute, Columbus, Ohio, remarked that, for that very reason some test, such as for secondary brittleness, which could be made on each rail steel heat at the mill, ought to be a valuable means of preventing dangerous metal from being placed in the track.

Prof. Albert Sauveur, Harvard University, Cambridge, Mass., reminded the audience that in his recent Campbell memorial lecture before the American Society for Steel Treating he had shown evidence that the many steels he tested had diminished ductility in the vicinity of 600 deg. C. He suggested that the reason the fractures in that temperature range favor the grain boundaries is because the heat is above the equi-axing temperature, where the amorphous phase becomes weaker than the crystalline phase. A. V. de Forest, Page Steel & Wire Co., Bridgeport, Conn., said that even though the ductility of the hot steel inside a rail heat possessed a diminished amount of ductility, it would not break unless it was stressed beyond its ultimate strength, nor could one imagine that the stretching inside a rail head would approach the dangerous elongation for the most brittle steel (five per cent). If actual cracking occurred it would be at a very small area where the ductility is considerably lower than the statistical average. This immediately suggested to others present the inference that internal weakness is due to weak centers (such as inclusions, thought by some to be the prime cause of internal defects).

British Researches on Cast Iron

A CUPOLA has been built at the Carron foundry from designs made by J. E. Fletcher, consultant for the British Cast Iron Research Association, by which a great advance has been obtained both in economy and cleanliness of operation. At present the furnace is producing 80 to 100 tons daily of metal at 1400 to 1425 deg. C., (2550 to 2600 deg. Fahr.) suitable for very thin castings, at a coke consumption of about 6 per cent.

Welding Practices In Big Tank Shop

Problems Encountered at Baldwin Locomotive Works When Instituting Welding as a Manufacturing Method and How They Were Solved

BY E. E. THUM

FOR some years a considerable amount of welding has been done in the Baldwin Locomotive Works. In the boiler shops it has been found very useful in avoiding concentration of metal in seams in water legs where danger of overheating is ever present, and in such other applications on stayed surfaces as are permissible under official regulations and codes or approved by the purchaser's inspectors. In other departments the cutting and welding equipment had been used principally for repair work, and only here and there on unimportant engine fittings. However, a rapid development of welding has taken place recently in the tender shop, a matter which will form the basis of the present article.

The truck and tender shop is one of the most recently constructed units at Eddystone. A major fraction of the floor space is devoted to the fabrication of the tender tanks, and in this was installed the most modern equipment adequate for bending, flanging, punching, erecting and riveting tank plates up to the maximum shipping widths and lengths. Its size may be appreciated when it is said that as many as 1200 men per shift have been engaged in this minor subdivision of locomotive manufacture.

As the result of a thorough engineering and production study of the possibilities of welding as applied to tank work, the Baldwin Locomotive Works adopted the position a little over a year ago that unless otherwise specified tender tanks would be completely fabricated by welding. This despite the fact that such a change would render moribund a considerable quantity of recently purchased fabricating machinery, air compressors and riveting equipment, and introduce a serious personnel problem among employees, many of whom had given faithful service for long years. How far this movement has gone is evident from the fact that four out of every five tenders now being built have welded tanks. And nearly all of them are the huge affairs holding up to 23,000 gal. of water and 30 tons of coal, required for the present practice of running engines on through traffic over two or three of the old divisions before uncoupling.

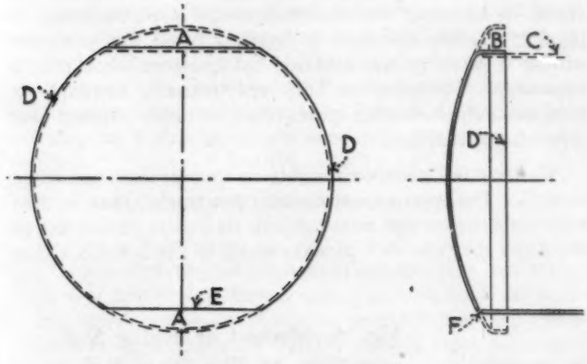


FIG. 1—Dished End of Vanderbilt Tank with Flat Top and Bottom. Layout for riveted joint at top; for welded joint at bottom (above)

Welding Favored by Purchaser and Manufacturer

From the purchaser's point of view the advantages of the welded tank are two—it is good looking and it is water tight. The value of good looks in so utilitarian a thing as an engine tender is not easy to appraise. It is part of the same movement which has caused the Baltimore & Ohio Railroad to paint in less somber colors and carefully stripe the engines on the fast express trains, and is bringing other roads around to chromium-plated cylinder heads and exposed fittings.

From the manufacturing point of view the principal advantage is its flexibility. Flexibility is an especially important feature where machinery is produced to individual design. In an ordinary month's business at Eddystone, locomotives would perhaps be shipped to 25 different railroads, and each railroad staff has its own ideas about the size, shape and kind of tender tank best fitted for its current requirements. Overall economies resulting from a flexible system of manufacture are apparent.

Details Where Corners Were Cut by Welded Construction

Two or three details used in fabricating the Vanderbilt style of tender—with a round water tank—will indicate

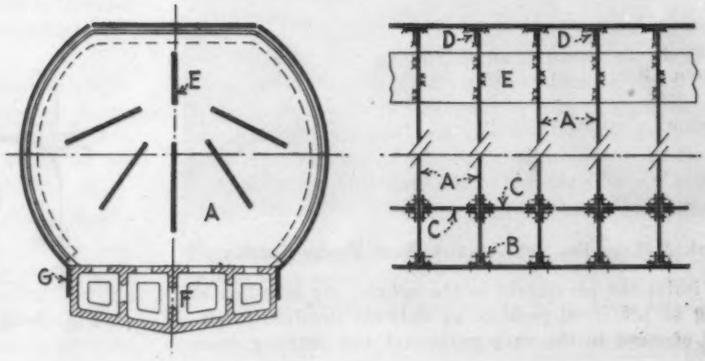


FIG. 2—Sections of Water Tank and Tender Frame, Showing Diaphragms. Detail at right, at top, shows welded construction; at bottom, riveted construction

FIG. 3—Welder on Work of Minor Importance—A Water Funnel, for Use at Tank Stations

how welding has simplified the design. The rear end is usually spun into a dished and flanged head (bought from the plate manufacturer for an extra of about $20). In the large tanks a low center of gravity and top clearances require that a segment of the head be trimmed off to match a flat top and bottom. In riveted design these segments *A* (Fig. 1) would be flanged over by hand, as shown at *B*, for a lap joint with the cover plate *C*. This hand work not only cost five or six times as much as the extra for the original spinning operation, but the heat so warped the remaining flanges *D* that the side wrapper plates had to be cut, punched and bent to individual measure and template. With welded design it suffices to cut the head square across, at *E*, and weld a corner joint with the intersecting top or bottom plate, as indicated at *F*.

Tender tanks with flat side walls must be stayed crosswise on three or four-foot centers to prevent bulging under water pressure. These stays are ordinarily diaphragms, and are themselves stayed to each other by longitudinal diaphragms. The inside of all water tanks of round or square outside appearance is therefore broken up into cells which effectively break up surges in the contents when the train lurches around a curve or to a stop. Figure 2 at the left indicates the general layout. At the right, below, it is seen that, when riveted, each cross diaphragm *A* is framed with two bent angles *B*, and the longitudinal diaphragms are a series of short plates *C*. Above, at the right, is shown how the number of parts is reduced and the construction simplified by welding. The framing member is a single T-bar *D*, and the cross diaphragms *A* are merely slotted with an oxy-acetylene cutting blowpipe, plates *E* of appropriate width are thrust through, long enough to reach end to end of the tank, and welded at each intersection.

Tank Makers Do Not Acquire New Trade Readily

As intimated previously in the article, the adoption of welding as preferred practice at Baldwin involved fundamental changes in the shop personnel, the drafting room practice and in the fitting up operations. The first mentioned was the most difficult to effect.

It was decided to train the more competent and adaptable tank makers, long employed in the shop, rather than to engage the required number of younger men expert in welding. This involved, of course, a period of months when the learner would be making easy welds, and in fact earning less money than he had at his old trade. The transition was successfully accomplished during the months when the proportion of welded tanks coming through the shop was being gradually increased.

A few of the men would not attempt the new work, and in fact much patience was necessary with those who did, since it is hard for old dogs to learn new tricks. Even though some of the older men may never be as skilled in actually making a joint as a young welder, they are far ahead in knowing the requirements of tank building, in judging whether the work is properly fitted, and are more willing to work in cramped and hot quarters when that is necessary. Furthermore, they are instantly available to form competent riveting crews when an order requires that type of construction.

Welders are grouped roughly in four grades, according to skill. The least expert do the "flat work," that is, they weld diaphragms and minor details on sheets placed flat on the floor; they are able to make welds in the down position,

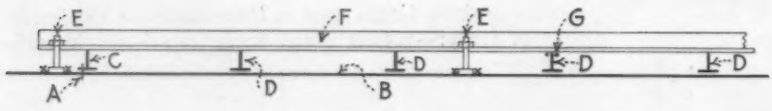


Fig. 4—Method of Fixing Stiffener Bars to Flat Plate Before Welding (at Left)

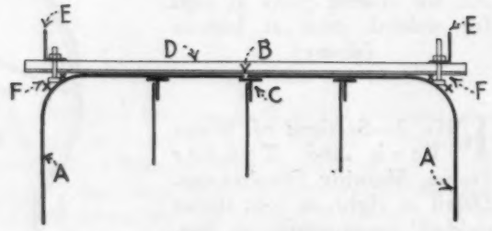
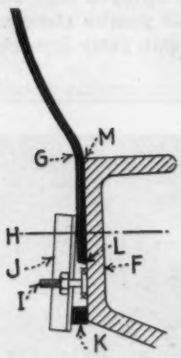


Fig. 5—Use of Long Strong-Back in Erecting Tank Plates

strong enough to hold and yet not smooth enough for exposed seams. The second grade welders are skilled enough to make flat and horizontal seams on the outside of the tank, that is to say: exposed, watertight work. The next grade is competent to do vertical and overhead work,



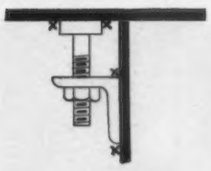


Fig. 6—Short Lever Used to Draw Up Lap Joints (at Left)

Fig. 7—Temporary Welds on Bolt and Angle Brace to Erect Butt Tee Joint (at Right)

while the highest grade of skill is required to fill erection holes with leak-proof weld metal. Men competent to weld overhead and make satisfactory plug welds are paid at about the same rates as the most competent fitters and riveters on the old wage scale.

New Drafting Standards

Shop drawings for welding look about the same as the ones from which riveted work is made. For either construction they dimension the general outlines and locate all the inner diaphragms, openings and minor attachments. Appropriate notes cover the rivet spacing, pitch and diameter, but the actual spotting of each hole is done on the steel plate or angle iron on the layout floor. For welded construction a number of standard joints and standard arrangements of staggered and intermittent welds have been adopted. These have been sketched on a sheet of standards, blueprints of which are framed and hung in various prominent locations in the shop. The draftsman then merely notes on the drawing, "Weld No. 24," as the case may be, with appropriate arrows to indicate the seam intended.

Fitting-Up Without Erection Holes

Welded construction, by its very ability to dispense with bolts and rivets for permanent construction, has introduced new problems in how to dispense with bolts for temporary fitting-up needs. In mass production of relatively small items jigs and work holding devices have been useful, but this is evidently no solution for welded structural frames and tank work. *Some* holes are necessary for handling and assembling purposes; how else could a Tee-bar stiffener be fixed in correct position across the center of a 10 x 30-ft. plate?

At the Baldwin shops the first solution was to punch two holes in plate and bar, and draw them together at the ends with erection bolts. After the required welding was done to fix the two into a unit, the bolts would be removed, and the holes plugged with filler metal.

This plan has several objections, even though an entirely satisfactory substitute has not yet been found. In the first place, two bolts are seldom enough to give a working fit throughout the entire length, due to slight waviness of the plates as received from the mills. A third or fourth erection hole could be provided, but it is hard to tell in advance just where the troublesome buckle will occur. Extra bolt holes are to be avoided, because as noted previously it is quite difficult to fill them with weld metal in a leak-proof manner—most workmen who can weld a 40-ft. seam which will resist seepage perfectly will have leaks in 95 per cent of their "rivet welds." But it has proved impracticable to eliminate holes entirely; even when a framing angle is attached to the edge of a sheet, where C-clamps can easily reach, the ordinary hammering from fitting up other parts will frequently cause the clamps to shift in position.

The best substitutes for a part of the open holes so far discovered are the temporary fitting-up bolts welded on, and used in conjunction with braces and strong backs. A few sketches will indicate their use. In Fig. 4, *B* represents a plate lying on the shop floor, to which a number of stiffeners *D* are to be welded at certain positions. Two or three holes would be punched in the end bar *C* and corresponding ones in the plate, whereby *C* can be firmly fixed by erection bolts *A* in the correct position. The remaining stiffeners are then held down by a couple of long angle irons *F*, and are located by spacer blocks from angle *C*, by shallow grooves cut in the flange of angle *F*, or between small pads of weld metal *G*. Strong-back *F* is held down by an appropriate number of bolts *E*, whose heads are welded to plate *B*. A wavy buckle at any place under any stiffener can be drawn up by a short strong-back and one or two similar bolts. After welding is completed, strong-backs are removed, and the bolts cut away with an oxy-acetylene torch—just under the head if on a concealed surface, or flush with the sheet if on an exposed surface, and smoothed by a portable grinder.

Similar long angle-iron strong-backs are useful in erecting the tanks. Fig. 5 is a plan of a square-ended tender. Side sheets *A* are bent to form half the rear sheet, and the center seam *B* is backed up by stiffener *C* on one of the inner diaphragms. The main sheets are held flat in the correct position until all inner and outer seams are welded by means of three or four cross angles *D*, clamped

Fig. 8—Portable Welding Equipment in Use. Part of the spot grinding has been done on the coal hopper to smooth slight bulges at internal welds

tightly behind stringers *E* by means of erection bolts *F* temporarily welded at the corners of the tank.

Short braces and lever-bars are very handy to draw up parts where the fit is a little loose, or to assemble a Tee-butt joint. Fig. 6 shows a detail of the assembly of side wrapper sheet of a Vanderbilt tank to the cast steel underframe (*G* Fig. 2). A few holes at level *H* would be drilled clear through wrapper sheet *G* and casting *F* for erection

down with a portable grinder before painting starts, a job which requires skilled attention lest the emery wheel do more damage than it corrects. Part of this grinding has been done on the coal hopper in Fig. 8.

After such spot grinding is done, and the plate sand blasted, a foundation coat of paint is sprayed on. Then the plates are all rubbed by hand with pumice stone and fine emery cloth and washed. Then a thin putty is worked

Fig. 9—A Completed Tender

purposes, but these should be kept at a minimum. Supplementary fitting, tight enough for welding continuous seams along *L* and *M*, is done by welding a number of bolts *I* temporarily to the steel casting and drawing the short angle *J* down against sheet *G* and loose fulcrum *K*.

Tee-butt joints between plates use temporary welds on both bolts and angles, as shown in Fig. 7, which needs no detailed explanation.

Much Grinding Required to Smooth Outside of Sheets

Adoption of welding as a major manufacturing operation has required the installation of a moderate amount of new equipment. About three dozen single-operator welding machines, mounted on trucks, are in use. Power lines were brought in and proper receptacle outlets installed on all the crane columns, so the electric cables leading to the electrode holders are as short as possible.

A rather more important item is the fact that more floor space is required to weld on the details prior to assembly erection. Since it is easiest to weld in the down position, much work is spread out over the floor which would be riveted standing-on edge.

Lastly, it is more expensive to finish and paint a welded tender tank than a riveted one. When there are no rivet heads sticking out to break up the light reflections, a fairly flat plate, shining in its final varnish coating, with waves 1/32 in. deep or even shallower, will have its irregularities greatly magnified in appearance.

All exposed welds on flat plates, such as butt seams, plug welds, and places where temporary attachments were made, must, of course, be ground smooth. But welds on the *inside* of a plate will cause enough plastic deformation in the adjacent heated metal to cause the outside scale to blister off, and leaves a permanent swelling in the metal, which lifts the surface about 1/64 in. above the general level. All these slight bulges must be ground into the minor depressions and pits with a wide-bladed, flexible putty knife, the specified number of coats of filler and black or colored lacquer are sprayed on, the striping carefully applied, and the result is a car of undoubtedly superior appearance.

Changes in Quenched Steel Upon Tempering

Precise studies on the evolution of heat by quenched carbon steels during gradual reheating have been made by S. Sato, and published in Science Reports, Tohoku Imperial University, October, 1929. In twelve steels, ranging from 0.20 to 1.8 per cent carbon, change points are noted as follows:

Temperature Deg. Cent.	Heat Evolution	Volume Change	Magnetic Change	Electric Resistance
150	slight	none	increase	decrease
280	great	Contraction, if retained austenite is present	decrease	decrease
370	slight	Contraction	increase	...
500	very slight	none	...	...

In Sato's view, which is supported by evidence from various sources, a quenched high carbon steel contains normally some retained austenite and much alpha martensite (a solid solution of carbon in iron, the lattice being a tetragonal intermediate between the face centered cubic of austenite and the body centered cubic lattice of beta martensite. In either variety of martensite the carbon atoms are at the center of the face of the elementary cells). At 150 deg. C. alpha martensite changes to beta martensite. At 280 beta martensite and the retained austenite both decompose into iron and molecular cementite (troostite). At 370 the molecules of cementite accumulate and crystallize into a complex crystalline lattice, and at 500 deg. the alpha iron, which has been mechanically strained during quenching, recrystallizes.

American Steel Industry's Future

Iron Needs Ample—Concrete and Aluminum as Competitors—Factors Which May Have a Marked Effect in Years to Come

BY DR. ZAY JEFFRIES*

DURING the life of this institute of less than 60 years, the annual production of pig iron in the United States has increased more than 23 times. Such a rate of growth may seem small when compared with that of the automotive industry which has increased 100 times in the last 20 years, or when compared with the growth of other industries of recent birth. The comparison appears less unfavorable, however, when the fact is taken into consideration that the iron and steel industry has existed on the earth in some form for thousands of years.

What the Industry Today Involves

MERELY to describe the high spots of the industry as it exists today would require a book of no small size. It involves the utilization of about 900,000 people, the payment of $1,400,000,000 in annual wages and salaries, the investment of $14,000,000,000, the mining annually of 70,000,000 tons of iron ore, 15,000,000 tons of limestone, and 120,000,000 tons of coal. It results in the production of 40,000,000 gross tons of pig iron and 50,000,000 tons of steel ingot. In addition, the industry includes ownership and operation of railroads and steamship lines, the production of cement, timber, coke, gas, by-products, and many other activities.

No matter with what satisfaction the past can be viewed, however, it is the potentiality or future which gives us most concern. The great scientist, teacher, writer and philosopher, Henry Marion Howe, in memory of whom this lecture is given, delighted to speculate about the future. In his monumental book, "The Metallography of Steel and Cast Iron," he philosophized concerning a hypothetical "ether mill" which the inhabitants of the earth might be able some day to use. The idea was that man might be able to tap the energy of motion of the earth in its orbit around the sun and as a consequence the earth would move nearer to the sun.

Previous Howe lecturers have discussed several phases of metallurgy and metallography in which Professor Howe was himself actively interested. By devoting this hour to a discussion of some phases of the future of the American iron and steel industry, we will be emphasizing another of Professor Howe's interests and especially one for which he gave much of his valuable energy during his last days.

Ample Iron for Future Needs

At the outset it can be stated with certainty that there is ample iron in the earth's crust for all possible future needs. The earth's crust contains about 5 per cent iron. There are in North America sufficient reserves meeting these requirements to last another generation and when these more desirable ores are depleted there are available unlimited quantities of more inaccessible and lower grade deposits.

There is no danger of exhausting the limestone supply, and coal reserves are sufficient to last many generations. The richer and more extensive deposits of manganese ores are not in the United States or Canada, but there is little danger of a world shortage of this element. It can therefore be definitely concluded that the supply of raw materials will not limit the growth of the American iron and steel industry.

The predominating position of iron in the metal industry is shown in the accompanying diagram. Of the new metal produced in the world, pig iron represents about 94 per cent. The non-ferrous metal production is represented on a scale 20 times that of pig iron for the purpose of comparison. Manganese and chromium are not included in the non-ferrous metals production, but nickel is. It will be seen that the total of non-ferrous metals has increased relative to pig iron during the last ten years and change in this direction may be more. A compensating factor, however, is the replacement of non-ferrous metals for some uses with the newer stainless irons and steels.

Large Resources in Non-Ferrous Metals

The three principal non-ferrous metals are copper, zinc, and lead. The earth's crust according to F. W. Clarke† contains only 0.01 per cent copper, 0.004 per cent zinc and 0.002 per cent lead. The production of these metals, even if they had the desirable characteristics of iron and iron alloys, which in many respects they have not, on a scale necessary to replace any considerable quantity of iron would seem to be improbable for even a short duration and practically impossible for any extended period.

Aluminum and magnesium are not so limited in supply of raw materials and consequently in the distant future we may look for iron and one or both of these light metals to provide the major metal requirements for mankind. There is ample supply of ores of the other metals, however, to last under present rates of expansion for several decades and it seems unlikely that any of the metals will ever be exhausted.

Because of the inexhaustibility of iron in the earth's crust, the great fitness of iron and its alloys for man's needs, the higher cost and limited quantities of the chief non-ferrous metals, the high cost and for many purposes, lack of fitness of aluminum and magnesium, it would seem to be a safe conclusion that in 20 years the iron production of the world will be at least ten times that of all non-ferrous metals combined.

There is a point in this connection, however, which may be stressed. Although the various metals are competing with one another for certain applications, one metal may be clearly superior for other uses. For example, aluminum competes with cast iron for internal

*Howe Memorial Lecturer before the annual convention of the American Institute of Mining and Metallurgical Engineers, in New York, Feb. 20. Dr. Jeffries is a consulting metallurgist for the Aluminum Co. of America and other companies, with headquarters in Cleveland. The lecture is here given more or less abridged.

†The Data of Geochemistry, Bulletin 770, U. S. Geological Survey.

combustion motor pistons but steel has no competition for rails. Each metal has gained its present position against severe competition. Each has such a variety of uses that a condition of substantial temporary stability obtains. Each metal supplies certain needs more economically than any other and by so doing helps to perfect our industrial machinery and to promote continued expansion in many directions.

Copper has been indispensable to the electrical industry, yet the gain in iron production as the direct result of the judicious use of copper has been even greater in tons than the whole of the copper production. In a similar manner we should regard all of the materials, whether metallic or non-metallic, organic or inorganic, as cooperating toward a sounder economic structure.

Concrete as a Competitor

One of the non-metallic competitors of iron and steel is concrete, which has in recent years substituted for steel in many places. Since 1885 the population has increased about 2.1 times. The pig iron production has increased from about 4,000,000 to about 40,000,000 gross tons annually from 1885 to 1929 and the output of Portland cement in the same period has increased from about 30,000 to 30,000,000 gross tons annually.

Thus the iron production has increased about five times as fast as the population and the Portland cement production about 100 times as fast as iron. In fact there are more cubic feet of cement produced in the United States now than of iron and a greater tonnage of concrete is poured annually than of pig iron. Yet I am inclined to believe that there is more pig iron produced currently than there would be if we had no cement or concrete.

But if one important material, in part competitive, like cement, can grow 100 times faster than the iron industry and the latter still show healthy and relatively rapid growth, it seems unlikely that the continued growth will be prevented by anything which may happen in the non-metallic materials industry.

Factors Needing Careful Thought

While it would thus appear that the iron and steel industry is basically well fortified against competition from either metallic or non-metallic materials, there are some factors which need careful consideration. In the first place, research and development in the iron and steel industry should keep pace with similar activities in other industries. It is perhaps not wise to put too much effort in attempting to apply iron and steel in places where other materials seem clearly better suited. On the other hand, it is the problem of the iron and steel industry to ascertain the applications where iron or iron alloys can serve most economically. There is no way to accomplish this save by aggressive research and development.

Many of the new metallurgical developments are coming to us from abroad. In recent years the stainless steels, the nitriding process and nitriding steels, and Izett steel have had their major developments from the research angle, in Europe. I suspect this is in part the result of the cumulative effect of research carried out over a long period of time. Reassuring for the future of metallurgical improvements in America are the researches now in progress. I think we may conclude that in the field of metallurgical research, the American iron and steel industry, even though it may not have been as active as might have been desired in the past, faces the future with bright prospects.

Possible Changes of Far-Reaching Effect

BUT in spite of anything research, management, or salesmanship can accomplish, we may expect changes which will affect the iron and steel industry for better or for worse. **The industry should try insofar as is possible to anticipate the effect of potential changes and to accommodate itself to them. Let us consider a few possibilities and in doing so give poetic license to our imaginations.**

1.—THE IRON AGE (Jan. 2, 1930) estimates that in 1929, 35 per cent of the steel consumed in the United States was used by the automotive and railroad industries. Of course much of this cannot be replaced by any other metal but a considerable tonnage must be moved about and energy is consumed in so doing. It is not unreasonable to suppose that as the cost of power increases, relatively, there will be a greater incentive to reduce weights of automotive vehicles and rail cars. This condition, at present, points to the use of more tubular structures and in many cases to light alloys. Perhaps the next five or ten years may not witness much change, but is not such a direction of change eventually inevitable?

2.—It now seems probable that the healthful ultra violet rays of the wave lengths obtained in sunlight can be readily provided in the future artificially. Such radiation would be produced in intensities sufficiently strong to benefit health and not too strong to cause harm. May not such a development throw the balance, already nearly ready to change, toward a new type of construction for some of our buildings? The ordinary or even extraordinary window has many deficiencies. Artificial light, artificial sunlight, and artificial ventilation would permit the use of cheaper construction, completely inclosed rooms free from drafts, uneven temperature, city noises, and other disturbances. Such rooms would be cool in summer and warm in winter. Buildings could be built of any desired size and especially of large size. How would such a change affect the iron and steel industry? There would be less steel used for a given volume of building space.

3.—We have already witnessed the development of a huge communication industry and we can be certain that more iron and steel have been consumed than there would have been without this industry. Perhaps the next phases of the industry which may have a decided bearing on our industrial life are facsimile transmission and television. Facsimile transmission will permit the sending of information by the page as readily as is done now by the word. Can there be any reasonable doubt that much of the mail of the future will be sent in this manner?

One method of facsimile transmission is photographing the television image. The whole field of television opens up so many possibilities for profound change in our methods of doing things that we should try to follow it as closely as possible. By using only knowledge and apparatus now available, it would be possible for one to attend a board meeting for any hour, say between two and three o'clock in New York, another meeting from two to three in Chicago, another from two to three in Denver and another from two to three in San Francisco on the same day and all the while be comfortably located in the Adirondacks, if in summer, or in the South if in winter.

Just as many business trips are now avoided by the telephone and telegraph, is it not probable that many more in the future will be made by sending the people, through wires or ether, in image but with synchronous voice connection?

4.—As time goes on an increasing amount of iron and steel is used in machinery and devices for handling snow. The chemical companies are working on the snow removal problem from another angle, namely, melting it with calcium chloride or other salts. Also gas companies are melting snow and ice in critical places. It is certain that snow on our streets, highways and railroads must be more quickly and completely removed in the future than is now the practice. It is important to the iron and steel industry to know whether the mechanical or chemical method will be more economical. I would not be surprised to see the chemical method gain the upper hand. If so, it would be only one of many examples in which mechanical processes, usually utilizing much steel, have given way to the chemical, using less steel.

5.—For the last example, I will quote from a paper, "Recent Economic Developments of Electric Power," by E. W. Rice, Jr., *General Electric Review*, November, 1929, page 583:

> The vacuum tube rectifier may prove to be of greater economic advantage in connection with the transmission of power. These tubes may be used

to convert the high-tension alternating current into high-tension direct current, which can be transmitted to a receiving station where an inverted vacuum rectifier, known as a "thyratron" will change the direct current back into alternating current. Such high voltage vacuum tubes give promise of not only being useful for transmission of large amounts of power to extremely long distances such as 500 to 1000 miles, but may have an important application in large cities. In many cases the vacuum tube rectifier and thyratron system may increase by two or three times the useful power capacity of existing underground cables. The investment in such cables runs now into many millions of dollars and any practical method of multiplying their output will prove of unusual economic importance.

This development may revive the old suggestion to locate electrical power plants near the coal mines or oil or gas wells and transmit more power through wires and relatively less on wheels with the use of less iron and steel per unit of power transmitted.

Effect of More Alloy Steel

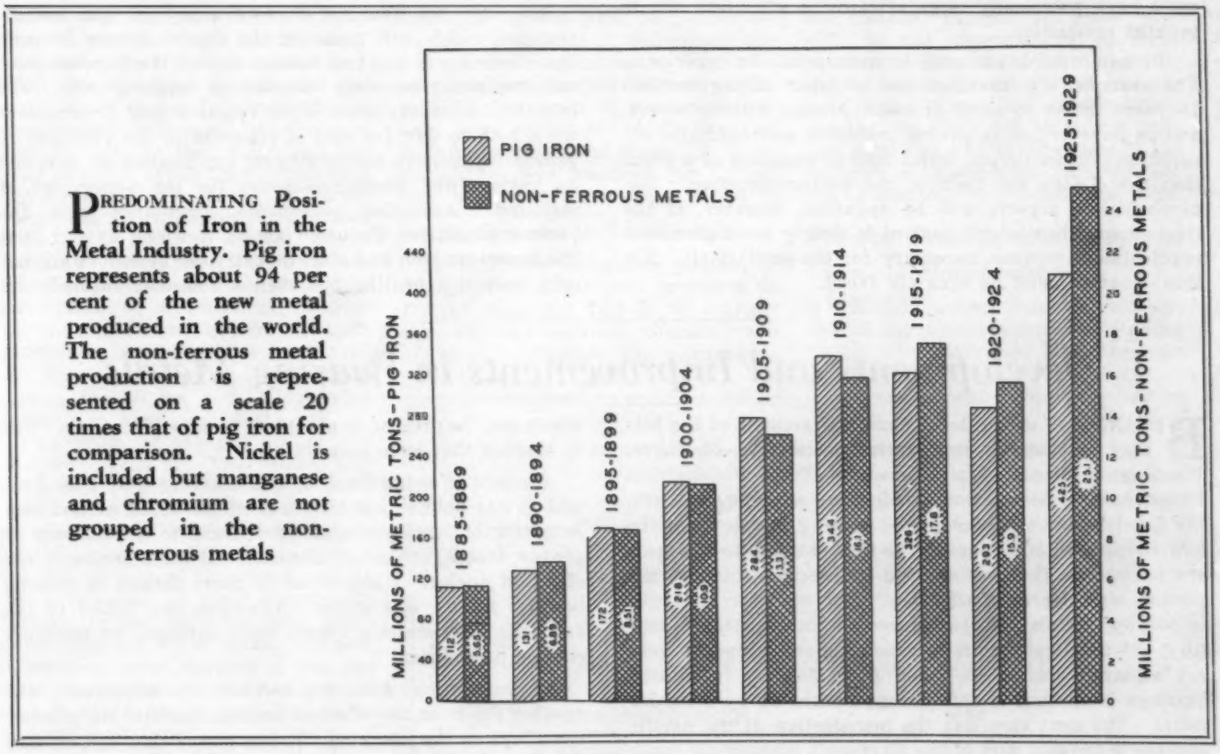
MANY other possible changes could be mentioned representing potentialities of things already known and certainly there will be a continuous flow of new ideas. New ideas can be expected in somewhat increasing numbers because of the cumulative effect of the training and experience of a constantly increasing research group. New ideas should, however, be still further stimulated because of the solid foundation of science on which to build.

The growth of the industry may be faster in dollars than in tons, however, because of the ever increasing demands for quality and for combinations of properties best provided in alloy steels. According to Cone, in 1909 in the United States only one ton of alloy steel was made for each 131.6 tons of total steel, whereas in 1928 there was one ton of alloy steel produced for each 16 tons total. We may, I think, expect the proportion of alloy steel to still further increase in the future.

Important as are the various points discussed above, however, there is another factor which is most important of all, namely, the general level of business. It is now well known that the iron and steel business is good when and only when business generally is good. The first requisite for a healthy future of the iron and steel industry is therefore a healthy general business. It should be the object of the iron and steel industry to try to promote general business health.

We have watched the vicious cycle of decreased sales, unemployment, reduction of buying power, still further decreased sales, still more unemployment, and so on, proceed with the idea that such a cycle is normal. Furthermore, we have watched the conditions leading to this vicious cycle with a feeling that they were uncontrollable. Now, under the leadership of President Hoover, supported and assisted by some of our greatest industrialists and economists, it is positively asserted that business depressions need not be so deep nor so long; that the business depression is not a disease, mysteriously contracted and which must run its course, but the symptoms are evident in advance and preventives can be used effectively. This is one of the most encouraging indications in the future outlook for all industry including iron and steel.

Notwithstanding the past depression and peak business cycles, business as a whole has shown an average growth greater than that of the population. It is desirable to have this rate of growth continued or increased. Growth calls for extra construction and equipment to provide for the increased production and this permits us to add currently to our reserves of real wealth.



PREDOMINATING Position of Iron in the Metal Industry. Pig iron represents about 94 per cent of the new metal produced in the world. The non-ferrous metal production is represented on a scale 20 times that of pig iron for comparison. Nickel is included but manganese and chromium are not grouped in the non-ferrous metals

Chief Essentials for Business Health

IT appears that the two chief essentials for business health are (1) opportunity for individuals to function and (2) the determination of proper rewards for services.

With reference to the individual's opportunity to function, we have been told so often of the depressing effect of our machine age and mass production on the workers that it may seem strange to conclude that conditions were never better any place or at any time for the individual's development than now in America. We are told that we are no longer developing mechanics as in the good old days. Why worry about developing mechanics when our

present system turns out instruments and machines in countless numbers with greater precision in dimensional control than the old-time mechanic could even measure? Most of us can remember the old-time plant with few offices, many laborers who worked long and hard, small sales force, and often no engineering or research. Contrast that with a modern industrial institution.

With so many kinds of activity each individual has a better opportunity to select work which he likes and in which he is proficient than under the old system. There is sufficient competition for the better positions to provide a stimulus toward better work, which in itself develops the individual. In spite of the great desire of individuals to advance, however, there are always vacancies in the higher positions, a condition which provides a healthy incentive for continued individual development.

Proper Rewards Difficult to Determine

The determination of proper rewards is perhaps the most important and difficult problem before the economic world and our industrial health will improve as these rewards become more exact. The individual, for example, must have potentially large rewards to stimulate him to greated production.

Proper rewards can only be approached by experience. For example, the increased pay of labor during the last 15 years seems to have provided greater buying power, and to have helped in giving profitable and healthful occupation to more people, which may be regarded as a proof that the change has been in the proper direction. The psychological aspects will be apparent, however, if the time comes when labor's reward is clearly too high and a readjustment becomes necessary for the good of all. Yet this situation must be squarely faced.

The price received for a commodity is a reward. The producer of the commodity suffers if the price is either too high or too low. It is the popular belief that cutthroat competition leading to temporary low prices for a commodity is beneficial to the purchaser. Nothing could be further from the truth. The more efficient producing units must make a profit in order to pay proper wages, to pay returns on capital invested, and to improve the business. Otherwise the prices will eventually increase. So the iron and steel industry can help in the maintenance of good business if it on the one hand avoids price wars, and on the other aims at only a fair profit, and it may be mentioned in passing that no profit can be considered fair which does not generously provide for the future development of the industry.

If we refer to the depression conditions as the vicious cycle, we may refer to the opposite conditions as the state of health. Even the physical and mental health of the people are important factors in business health. Well people have great energy and are heavy consumers of goods; they have great ability to produce and they do not fear the future as to gaining a livelihood.

Although we can not foresee many of the specific changes which will come in the future it can be said that there are in sight no factors outside the iron and steel industry which seriously threaten its future growth. The industry, however, needs more research and development work both to pay for sins of omission in the past and to provide aggressive but intelligent exploitation of iron and its various and wonderful alloys for the betterment of mankind. Assuming reasonable compliance with the various conditions discussed above, it would appear that the American iron and steel industry can look forward not only toward a healthy but even a romantic future.

Developments and Improvements in Bearing Metals

BEGINNING with a brief historical account of the history of bearings and bearing metals, W. M. Corse, Washington, discussed at a meeting of the Philadelphia Foundrymen's Association, Wednesday evening, Feb. 12, the development of bearings and bearing metals from the bow string drill of antiquity, the first bearing, to the modern mechanism that has enabled engineering to reach the present high degree of efficiency. The need for plasticity in bearing metals was recognized in the eighteenth century, but practical results in producing this property were not achieved until 1839, when Isaac Babbitt introduced bearings consisting of soft linings backed up by a harder metal. The next step was the introduction of the plastic bronzes in the last part of the nineteenth century.

A statement was made by Mr. Corse of the requirements that must be met by a good bearing metal, and the white bearing metals, the bronzes, and the graphite bearing metals were discussed in turn. Attention was called to the importance of the pouring temperatures of the different types of white metals to obtain good results.

Recent improvements to the lead-base alloys were outlined, some of these consisting (1) in increasing the strength of the lead-rich matrix by adding alkali or alkaline earth metals, (2) or in increasing the strength of the other constituents embedded in the matrix by the additions of nickel and cadmium. Frary metal and Bahnmetall are examples of the first process, and Thermit metal illustrates the second process. Both are valuable developments because they eliminate the necessity of using tin.

Bronzes were developed by inventing methods for including lead in the alloy without encountering segregation or liquation. It was pointed out that it is necessary to guard against scoring by hard crystals of copper phosphide which may be present in phosphor bronzes, and of tin oxide in bronzes that have been burnt.

Factors affecting the design of bearings were gone into, and it was pointed out that loss of power, wear and consumption of lubricant must be reduced to a minimum by proper design, choice of material and maintenance. The effect of neglect of any or all of these factors in causing bearing failure was given. Attention was called to the fact that good materials were often damaged by improper casting procedure.

In connection with the subject of lubrication, the speaker dwelt on the effect of certain constituents of bearing alloys on the lubricant. It was stated that copper, zinc and apparently antimony act catalytically to decompose fatty oils which are especially favorable to lubrication. The present state of knowledge of friction and lubrication was discussed—thick film lubrication depending only on forces due to relative motion of metal and lubricant, the only property of the liquid involved being the viscosity, whereas in thin-film lubrication other properties of the lubricant come into play, principally oiliness. The oiliness, and hence the friction, in the case of thin-film lubrication, depends greatly on the chemical nature of the lubricant, particularly on the presence of certain types of molecules.

Fatty acids were mentioned and the author pointed out the fact that it would pay to make a general investigation of the influence of the fatty acids on the different metals, as well as to determine which acids are harmless and which are dangerous. Such tests would be welcome, as Woog's process showed that stearic acid is the chief agent for the reduction of friction. In 1920 Wells and Southcombe proposed to increase the lubricating value of ordinary mineral oils by adding minute amounts of fatty acid.

Producing Artificial Manganese Ore

Experiments Demonstrate a Practical Method of Production, Using Blast Furnaces and Open-Hearth Furnaces*

LARGE deposits of manganiferous iron ores, representing several million tons of metallic manganese, occur in the United States. The Minnesota deposits of such ore are of outstanding importance because of their size, state of development, ease of mining and proximity to the Great Lakes, which permits water transportation to steel centers.

In view of the fact that our steel industry requires large quantities of manganese, for which no satisfactory substitute has been found, and because our reserves of ferro-grade ore are comparatively small, the development of methods that will make our large deposits of manganiferous iron ores available as a source of ferromanganese is an important problem. Some years ago the United States Bureau of Mines and the Minnesota School of Mines undertook jointly the development of methods for recovering the manganese content of manganiferous iron ores in a form suitable for the production of ferromanganese, the 80 per cent alloy indispensable in producing steel.

Two types of manganiferous iron ores are available: The brown ores are higher in iron and lower in manganese than the black ores; the black ores are more siliceous but contain less phosphorus. The utilization of the iron content of the brown ores in the production of steel appears to furnish the best basis for their treatment. The method of attack has been to work out modifications in iron and steel practice so as to recover manganese in the form of slag comparable to ferro-grade ores.

Experiments Show Feasibility of Project

The greater part of the experimental work has been conducted with a 6-ton blast furnace and a ½-ton basic open-hearth. This paper is devoted mainly to open-hearth tests in which high-phosphorus spiegel (12 to 15 per cent Mn, 0.5 per cent P) was treated to separate the manganese from the phosphorus and the iron. Results from a series of electric-furnace heats show that the high-phosphorus spiegel, produced from Cuyuna manganiferous iron ores, can be treated also in the electric furnace. These results make it possible to compare the operations when carried out in the open-hearth and in the electric furnace.

A former report by the authors shows that the amount of metallic manganese needed in the form of ferromanganese and spiegel has not decreased in the past 15 years, although the amount of manganese derived from manganiferous iron ores has increased tenfold. For example, in 1911 shipments of manganiferous iron ores contained 14,629 tons of metallic manganese. About 14 lb. of manganese was required per ton of steel that year.

No Decrease in Requirements

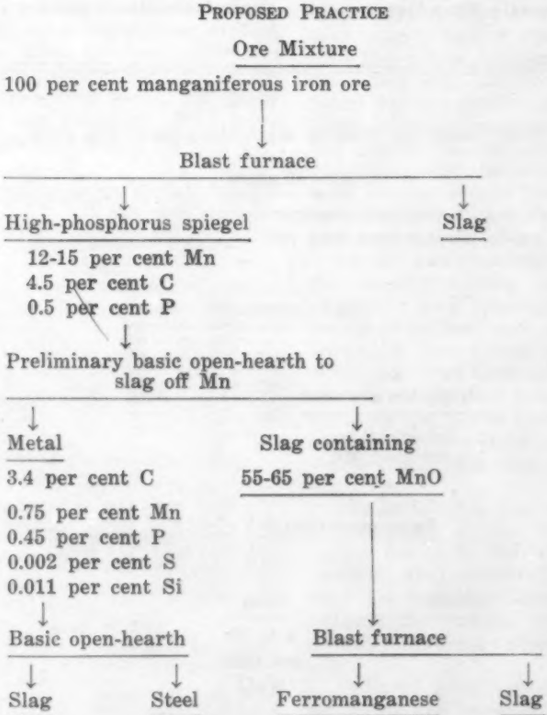
In 1927, the manganese content of manganiferous iron ores amounted to 153,756 tons, but 14.3 lb. of manganese was still required to make a ton of steel. Although the manganese supplied in manganiferous iron ores is about one-half the total requirements in the form of ferromanganese and spiegel, our needs for manganese in the form of these alloys have not decreased.

The manganese content of some new types of steel has increased markedly and general specifications have also increased. It appears that the residual manganese, made possible by the increased use of manganiferous iron ores, has approximately offset the amount of manganese needed to meet higher manganese specifications. If this were not true, one would expect an increase in the amount of manganese required per ton of steel during the last few years.

Present Practice and Proposed Modifications

UNDER present practice, sufficient manganiferous iron ore is added to the ore mixtures of blast furnaces

Flow Sheet for Making Ferromanganese from Manganiferous Iron Ores



*From a paper by T. L. Joseph, E. P. Barrett and C. E. Wood, all of the North Central Experiment Station, United States Bureau of Mines, Minneapolis. The paper was presented by Mr. Joseph, Feb. 19, before the New York annual meeting of the American Institute of Mining and Metallurgical Engineers.

making basic iron to produce metal containing from 1.5 to about 2.0 per cent manganese. When this high-manganese pig iron is charged into the basic open-hearth furnace, with about equal or slightly greater amounts of steel scrap, most of the manganese passes into the slag, which will contain from 5 to 10 per cent MnO.

In the proposed practice to recover manganese in a form suitable for making ferromanganese, manganiferous iron ores are not mixed with straight iron ore but make up the entire ore charge. In this procedure, high-phosphorus spiegel containing from 10 to 15 per cent manganese is produced, in place of basic pig iron with 1.5 to 2.0 per cent manganese. By giving this spiegel a preliminary treatment, the manganese can be concentrated so that a slag containing from 55 to 70 per cent manganous oxide will be produced in place of normal open-hearth slag containing from 5 to 10 per cent manganous oxide. The basic idea underlying the proposed practice is to concentrate the manganese to a point where a product suitable for making ferromanganese will be produced.

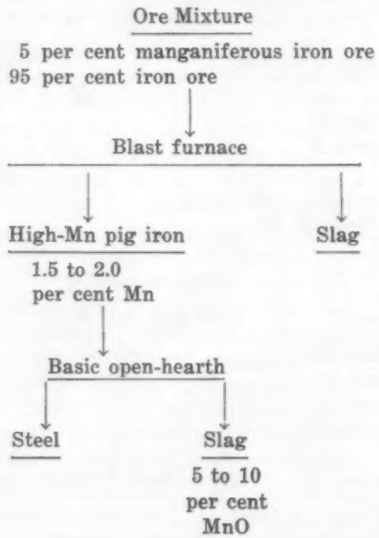
In present practice the manganese is diluted with lime, silica and alumina, and contaminated with phosphorus, to such an extent as to limit its use in making high-manganese pig iron and prohibit its use for making ferromanganese or spiegel. In normal open-hearth slags, lime, iron oxide and silica are the principal constituents. However, when an alloy containing 15 per cent Mn is oxidized by the usual open-hearth procedure of adding iron ore, and no limestone or dolomite is used, manganous oxide and ferrous oxide become the principal slag constituents. By adjusting the iron and phosphorus content an artificial ferro-grade product is obtained.

Equipment Needed to Meet Requirements

About 15 blast furnaces, each having a daily capacity of 400 tons of spiegel containing 15 per cent manganese, would be required to produce sufficient high-manganese slag to manufacture 300,000 tons of ferromanganese annually.

About 120 tons of high-manganese slag could be produced from the daily ouput of a 400-ton spiegel furnace. Three 50-ton open-hearth furnaces would be required to treat the 400 tons of spiegel daily. From the 120 tons of high-manganese slag, about 56 tons of ferromanganese could be produced daily, or approximately 20,000 tons annually. About forty-five 50-ton open-hearth furnaces would be needed to supply 300,000 tons of ferromanganese annually. That open-hearth capacity would be lost for general steel production, but inasmuch as one ton of metal is produced from each ton of spiegel treated, only about 40 per cent of the blast-furnace capacity used would be lost. This loss is a result of the lower daily capacity of furnaces operating on spiegel as compared with pig iron. Four blast furnaces and fifteen 50-ton open-hearth furnaces would meet one-third of our ferromanganese requirements.

Flow Sheet for Making High-Manganese Pig Iron



New Aluminum Paint Resists High Temperatures

An aluminum paint has been recently developed which is claimed to have unusual properties when applied to steel parts, so far as resistance to scaling and oxidation at high temperatures are concerned. It has been put on the market by the Ultra Fuzon Distributing Co., 151 Fifth Avenue, New York, and it is offered under the trade name "Ultra Fuzon."

The company states that after extensive research work its laboratories, in an endeavor to produce a high heat-resisting paint, came to the conclusion that the desired results could not be obtained by the old methods of treating the liquid, but that the pigments or powders must be treated. They finally succeeded in discovering a method whereby a chemically treated aluminum powder formed the basis of a heat-resisting aluminum paint.

It is claimed that it will withstand sustained temperature up to 2000 deg. Fahr., and that it will retain its silver color up to 1200 deg., beyond which the color becomes dark gray.

Ultra Fuzon is applied by brush, spraying or dipping.

Spring Washers of Rustless Steel

A stainless or rustless steel for the manufacture of lock washers has been perfected by the Reliance Mfg. Co. with plants at Massillon and Mansfield, Ohio, makers of lock washers and cold drawn alloy steels. It is now prepared to furnish the trade with these in any size and section. In addition to having all the qualities of a noncorrosive, stainless steel, they are of a spring temper equal to that of the ordinary steel lock washer now being used.

The rustless steel from which these washers are made is drawn in the company's own steel drawing mill at Massillon, and is, through a special rolling process, finished in a Brinell of sufficient hardness to produce the stiffness and reactive pressure necessary in a spring lock washer. The processing of this steel is such as, in producing the stiffness above mentioned, makes subsequent heat treating unnecessary.

This company is also in position to furnish the trade with rustless steel in coils or straightened and cut to length in any small section—round, flat, square or hexagon from 0.022 up to 5/16 in.

"Acid-Resisting Cover Enamels for Sheet Iron" is the title of Bulletin No. 201 of the engineering experiment station of the University of Illinois, Urbana, Ill. The author is Andrew I. Andrews, associate professor of ceramic engineering. It discusses tests for acid-resisting enamels and there are several chapters devoted to their development. There are 15 figures and seven tables.

Gray Iron Made From Steel Scrap

Production in Electric Furnace Described—Combination of Low Power Cost, Available Scrap and Unsatisfied Pig Iron Demand Needed

BY T. F. BAILY*

DURING the World War, in both this country and Canada, attempts were made to make pig iron from steel scrap in the electric furnace. A considerable tonnage of white pig iron was produced, the silicon and manganese additions being made with ferroalloys. But is is believed that the experiments conducted at Canton, Ohio, in 1927 were the first successful attempts at producing gray iron with silicon and manganese additions made from the oxides of these metals reduced directly in the furnace, although a number of years ago a smaller experimental unit was operated by the same method and produced gray cast iron of low silicon and manganese content.

The furnace used for this experimental operation was of the shaft type. It had three electrodes in the top of the furnace set at an angle of about 15 deg. and one electrode in the bottom. The furnace shaft was filled with coke, so that the arcs of the three upper electrodes played directly on the top of the coke column, the current flowing from electrode to electrode at the top. As the furnace was star connected a certain portion of the current went to the bottom electrode. The height of the coke column was approximately 6 ft.; the diameter of the furnace at the top inside was 4 ft. and at the bottom, 2 ft.

How the Furnace Was Operated

Material was charged through a hole in the center of the roof and lay on top of the coke column. Here it was melted by the three upper arcs and immediately passed down in small streams or globules through the heated coke or carbon, rapidly absorbing carbon from the coke column to the saturation point, reducing the oxides of manganese, silicon and phosphorus in the charge and passing through the calcium slag for the reduction of the sulphur content. In all, over 100 heats were made, all of which showed substantially full carbon saturation, all producing gray iron with silicon content of from 1 to 3 per cent.

[Two furnaces were illustrated in the paper, one, an 800-kw. unit, made 1 ton of pig iron an hour. The other, of 5000 kw., has capacity for 150 tons a day.]

Test bars were cast from a number of these heats and test bars were also cast from the pig iron rerun in a cupola at some of the local foundries. Results of some of these tests are given in an accompanying table.

Repeated duplication of the charges indicates clearly that the phosphorus and manganese can be recovered readily from basic open-hearth slag in this type of furnace, that the lime of the slag can be used effectively for sulphur removal, that the silicon can be increased to any amount by the addition of sand, and the carbon content of the heat brought up to full saturation for any given silicon content; it being understood, of course, that sufficient carbon is charged to take care of the carbon requirement both for the reduction of the oxides and for saturating the bath itself.

Close Control Obtained

Analyses of 20 consecutive heats in which the carbon, silicon, phosphorus and manganese additions were made as outlined, show the sulphur content kept below 0.044 per cent. The average power consumption for these 20 heats was 1005 kwhr. per gross ton of pig iron produced, of an average analysis of 3.89 per cent C; 2.46 per cent Si; 0.032 per cent S; 0.465 per cent P; 0.775 per cent Mn; 0.04 per cent Cr; 0.06 per cent Ni. The average yield of pig iron was about 93 per cent of the scrap charged, and the electrode consumption was 9 lb. of graphite electrodes per gross ton of pig iron produced.

Table I—Effect of Oxides for Alloy Additions and for Sulphur Removal

Charge					
	Lb.				
Steel scrap	800	2000	2300	2300	2300
Coke	...	114	250	350	285
Lime	...	80	100	100	...
Sand	87	190	150	150	100
Ferromanganese	...	10	9	9	...
Phosphate rock	...	...	75	100	100
Basic open-hearth slag	...	...	...	...	200
Fluorspar	...	5	...	...	...
Analysis of Pig Iron Produced					
	Per Cent				
Carbon	3.26	3.88	4.00	3.77	4.01
Manganese	0.32	0.82	0.79	0.76	0.72
Sulphur	0.164	0.032	0.036	0.037	0.026
Phosphorus	0.098	0.107	0.396	0.450	0.636
Silicon	1.98	2.95	2.28	2.09	1.88
Chromium	...	...	0.06	0.42	0.36
Nickel	...	...	0.11	0.99	1.07
Analysis of Slag					
SiO_2	...	50.32	39.76	38.64	37.82
Al_2O_3	...	12.76	1.19	18.04	20.48
Fe	...	...	...	...	1.34
CaO	...	35.92	39.02	41.32	37.78
MgO	...	Bases	Bases	Bases	Bases
S	...	...	...	0.85	...

Materials Used Were Cheap

While all these heats were run with steel scrap or borings, it is believed that this same type of furnace would work equally well on sponge iron, and that the power consumption of 750 kwhr. per gross ton would be a fair figure for the production of pig iron of the silicon, manganese, phosphorus and carbon content given, based on the silicon addition being made from sand, the manganese from manganese ore or basic open-hearth slag, and the phosphorus from phosphate rock.

All the raw material used was of the cheaper variety, such as sheet clippings, long turnings, No. 1 and No. 2 busheling, and cast iron borings. No heavy iron scrap or steel scrap was used because this material demanded a higher price in the market than the lighter grades mentioned and did not seem to be so well adapted commercially for the production of pig iron.

One noticeable feature was that substantially all the chromium and nickel found in the scrap was recovered, due undoubtedly to the fact that the material from the time it entered the furnace was in a completely reducing atmosphere until cast.

Table II gives comparative figures on the Brinell hardness, deflection and ultimate strength of electric iron cast directly from the furnace, electric iron

*Baily Furnace Co., Canton, Ohio. Abstract of paper read Feb. 19, at New York, before American Institute of Mining and Metallurgical Engineers.

rerun in the cupola, and blast furnace iron rerun in the same cupola.

All the electric-furnace iron, whether cast directly from the furnace or rerun in the cupola, had a high pearlitic constituent, always running above 30 per cent, and at least 10 per cent higher than the blast furnace iron rerun in the cupola. Brinell hardness in all cases was slightly under that of blast furnace iron of the same chemical composition and the machining qualities of the electric iron were equal to those of the blast furnace iron, if not actually superior.

The electric iron cast directly from the furnace or rerun in the cupola had a higher deflection than blast furnace iron of the same chemical composition, even though the conditions surrounding the casting of the test bars from the electric furnace were by no means ideal, as these bars were all cast in very cold weather and sometimes in frozen molds. An outstanding characteristic of this iron cast in chilled molds was that, regardless of the temperature of the mold, there was little if any evidence of chill in the iron.

It is believed that, in localities where there is a demand for pig iron and where scrap steels can be obtained at a relatively low price, electric pig iron could be produced economically, of a quality not possible to produce by the blast furnace, and that the electric iron can be cast directly from the furnace, with physical properties superior to those of iron produced in the cupola.

Scrap Often Unavailable

IT was mentioned by the chairman, Dr. G. B. Waterhouse, that the Pacific Coast area might prove a particularly good region for the application of Mr. Baily's proposed scheme to produce gray iron from steel scrap in the electric furnace. The suggestion was based on the hypothesis that electric power is cheap and plentiful, that scrap is in much greater quantity than available pig iron of local production and that the demand of foundries for gray iron would operate strongly.

In response to this suggestion, however, Mr. Baily reported that he had made a survey of the scrap situation over that area some time ago and found scrap decidedly scarce—aside from the scrap which was being absorbed by the open-hearth plants as fast as it was made.

This report of scarcity of scrap available for the present purpose was confirmed by Clyde E. Williams, of the Battelle Memorial Institute, Columbus, Ohio, who had formerly done a large amount of work on the Pacific Coast and had become familiar with this phase of the situation there. Mr. Williams reported that during the World War he had been concerned with experiments directed toward somewhat the same end as those which Mr. Baily now reports.

There was at that time no blast furnace, within reach of the Pacific Coast and, of course, iron from India was not coming in there then. There was, therefore, a great demand, largely unsatisfied, for pig iron of foundry grades. The 600-kw. electric furnace with which Mr. Williams was then experimenting was turning out about one ton an hour through the use of steel and iron turnings and other finely divided scrap, such as is not favored by open-hearth operating men for their practice.

Stanley Tool Now Making Ajax Hammers

Stanley Electric Tool Co., subsidiary of Stanley Works, New Britain, Conn., which recently acquired the trade name, stock on hand, tools, etc., of Ajax Electric Hammer Corporation, New York, announced that the Ajax line will be manufactured at the New Britain plant, and will be marketed under the trade name of "Stanley-Ajax."

These hammers are intended for drilling in concrete, etc., chiseling wood or steel, vibrating castings and similar uses. They are light in weight and well balanced and incorporate a patented mechanism that eliminates transmission of shock of the cutting tool to the motor, housing or operator. All parts are made from alloy steel and ball bearings are used throughout.

The smaller machine, designated as the type 310, weighs only 10 lb., is 16¼ in. long, and has a capacity of 1⅛ in. in concrete. It strikes 2500 blows per min. The next size, the 320, has capacity of 2 in. in concrete and weighs 22 lb.

Iron Alloys Research Financed

Funds for a five-year program for Alloys of Iron Research have been subscribed, according to an announcement by Alfred D. Flinn, director of Engineering Foundation, and personnel for the work is now being engaged. As has been noted in these columns from time to time, this research is to be primarily a collection and critical review of the literature on iron and its metallic alloys, and is estimated to require a minimum of $30,000 a year. Financing for the five years has been completed under the leadership of Alva C. Dinkey, president Midvale Co., and E. A. S. Clarke, secretary American Iron and Steel Institute.

Frank T. Sisco, formerly chief of metallurgical laboratory, Wright Field, Dayton, Ohio, will be in active charge of the research; he has established an office in Engineering Societies Building, New York. Laboratory investigations have been under way for two years or more at Carnegie Institute of Technology on the iron-manganese alloys, a branch of the cooperative investigation into steel making methods which has been frequently reported in THE IRON AGE. Library and laboratory work on iron-silicon alloys have also been instituted at Lehigh University.

Illinois manufacturing industries showed a 1.5 per cent decline in employment for the month from Dec. 15 to Jan. 15, according to the Bureau of Statistics and Research of the Illinois Department of Labor. In the previous month the employment decrease was 3.3 per cent.

Link-Belt Co. reports net income of $3,484,686, equivalent after preferred dividends to $4.54 a share on the common stock, compared with $4.21 a share for 1928. The balance sheet as of Dec. 31, 1929, shows current assets of $15,827,339 and current liabilities of $1,113,981.

Table II—Comparison of Chemical Analysis and Physical Properties of Electric Pig Iron and Blast Furnace Iron

	Si, Per Cent	P, Per Cent	S, Per Cent	Mn, Per Cent	C Combined, Per Cent	C Graphitic, Per Cent	Ni, Per Cent	Cr, Per Cent	Brinell Hardness	Load, Lb. per Sq. In.	Deflection, Inches	Specific Gravity	Ultimate Strength
Electric pig iron cast directly from furnace.	1.91	0.472	0.047	0.653	0.34	3.38	0.054	0.064	144	2,650	0.151	7.085	23,460
Electric pig iron cast directly from furnace.	2.83	0.540	0.052	0.745	0.28	3.27	0.070	0.084	179	2,680	0.164	7.080	15,060*
Blast furnace iron rerun in cupola.....	2.44	0.794	0.070	0.686	0.15	3.33	0.045	0.052	163	3,285	0.180	7.024	20,530
									143	2,840	0.182		18,850
Electric pig iron rerun in cupola.....	2.27	0.500	0.060	0.556	0.30	3.30	0.058	0.069	149	3,340	0.192	7.105	21,390
									159	2,600	0.156		25,130
Blast furnace iron rerun in cupola.....	2.17	0.396	0.076	0.626	0.34	3.25	Tr.	0.015	163	3,200	0.158		20,060
									163	3,650	0.122		21,870
Electric pig iron rerun in cupola.....	2.18	0.432	0.071	0.594	0.44	3.25	0.001	0.025	159	3,900	0.182		20,040
									156	3,150	0.155		18,280

*Full of blowholes.

Promotes New Copper Alloy

Hardened Copper with Superior Ductility Offered as Substitute for Expensive Bronzes

P.M.G. METAL, a hardened copper alloy which has attracted considerable attention in England, is now available to foundrymen in the United States. Driver-Harris Co., Harrison, N. J., having acquired American rights, are marketing ingots of the alloy suitable for remelting in crucibles, reverberatory or electric furnaces.

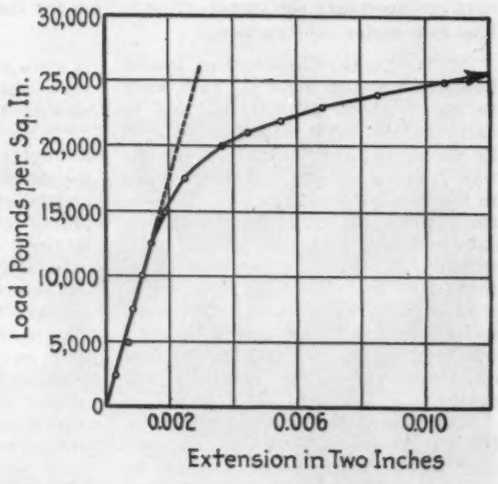
According to Dr. M. A. Hunter, professor of electrometallurgy at Rensselaer Polytechnic Institute, Troy, N. Y., and consulting engineer for Driver-Harris Co., P.M.G. metal was developed, as its name denotes, as a substitute for phosphor bronze, manganese bronze, and gun metal by the technical staff of Vickers-Armstrong, Ltd., at the naval construction works at Barrow-in-Furness, England.

At that plant it has superseded admiralty gun metal (88 copper, 10 tin, 2 zinc) wherever specifications and purchasers permit. Poor casting qualities and relatively long freezing range are a source of trouble with 88:10:2; P.M.G. metal is, so far as can be ascertained, superior. It has been found superior to manganese bronze, to 70:30 brass and 9 per cent aluminum bronze in many applications. Its introduction has resulted in a considerable reduction in the number of non-ferrous alloys used in the Vickers-Armstrong works.

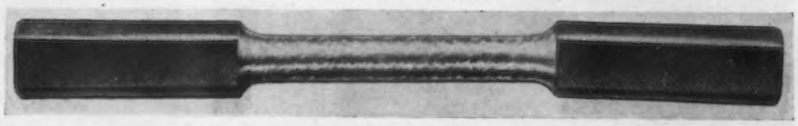
When used as a substitute for admiralty gun metal the 10 per cent of tin is replaced by 10 per cent of a special hardener. The cast alloy contains as its major constituents 2 per cent of iron and 3.4 per cent of silicon with 2 per cent of zinc. According to Dr. Hunter the hardening is presumably due to the presence of iron silicide. This compound dissolves in the molten copper and on cooling, precipitates from the solid solution in submicroscopic particles in such a manner as to increase the hardness of the solidified alloy.

Microstructure of the alloy as cast is that of a single solid solution. It has the unique property among hardened coppers of having good ductility. The properties of P.M.G. metal, as in similar cases of precipitation hardening, can be modified by quenching with or without subsequent reheating.

Physical properties of the cast and forged metal are given in the table. The halftone shows a 0.505-in. test piece cut from a cast test bar which remained unbroken after loading to 50,000 lb. per sq. in. (the limit of the testing machine). Elongation of approximately 10 per cent extends from shoulder to shoulder, and subsequent fracture would have taken place with inappreciable necking. Stress-strain curves show indefinite yield points; the piece behaves in an elastic manner up to about 12,500 lb. per sq. in. and below that unit load has a modulus of elasticity of about 17,400,000 lb. per sq. in.



STRESS Strain Curve and Cast Test Piece Just Before Fracture. Note that elongation is generally distributed from shoulder to shoulder of test piece. Load and extension bear a constant relationship up to about 12,500 lb. per sq. in.; rapid yielding occurs at something over 20,000 lb. per sq. in.



Melting practice was demonstrated Feb. 28 at the Harrison plant of Driver-Harris Co. before an invited group of nearly 50 metallurgists and engineers, and seemed to offer no difficulties. The metal was melted under a charcoal cover, and poured as ordinarily would be the practice with admiralty metal. Foundry returns can be remelted with but little loss. It can be cast into wet or dry sand or metal molds, prepared in the ordinary way for the casting of high quality copper alloys. Moderate sized gates and risers are sufficient.

In casting, the metal is clean and fluid and can be cast in thin sections which take the impression of the mold well. It is quiet in the mold and sets rapidly, having a short freezing range of 50 deg. C., thus minimizing possible segregation. Castings removed when red-hot from the sand do not scale in air. The sand castings have good surfaces and can be cleaned readily; for many applications sand blasting is unnecessary, especially if cast in dry sand.

Dr. Hunter said that P.M.G. metal can be readily forged hot. In one experiment a 3-in. chill-cast round billet was heated to redness and forged under the hammer to a 1-in. square without difficulty and no sign of cracking could be detected in any stage. The bar was allowed to cool further and one end was forged at a black heat to 0.88-in. section. During the latter operation the metal was hard and a large number of blows was required but no cracking occurred. Tensile properties are given in the table. Hot-rolled wire rods, and spools of very fine wire drawn from them were also exhibited.

Uses suggested are for those parts requiring high tensile strength, considerable elongation and pronounced resistance to abrasion. It is used at the Vickers-Armstrong works for bearings, cylinder linings, branch pieces, valves and valve bodies where the pressure in the mold reaches 1500 lb. per sq. in. It has also been extensively used for fittings for steam plants, valve bodies and spindles, forged and cast valves and valve seats, glands and bushings used under 160 lb. per sq. in. pressure, and under saturated steam conditions up to a total heat of 540 deg. Fahr. including superheat. Hydraulic fittings have also been successfully cast with gratifying freedom from pin-hole leakage, even under pressures of 6000 lb. per sq. in. on cast walls ¼ in. thick.

Mechanical Tests on P.M.G. Metal (10 *Per Cent Hardener in Crucible*)

	Castings	Forged Hot 3 to 1	Forged Cold 1 to 0.88
Tensile properties:			
Yield point, lb. per sq. in.	23,500 to 27,800	45,900 to 56,500	82,600
Ultimate strength, lb. per sq. in.	47,500 to 49,300	76,200 to 77,950	94,000
Elongation, per cent in 2 in.	10 to 13	34 to 42	17
Fracture	Fine grained	Silky; cup	Silky; cup
Brinell hardness	104 to 109	126 to 143	149 to 153
Density	8.45	8.44	.....

Welded Gas Containers Disapproved

Not in Accord With Best Safety Practices, Rules Interstate Commerce Commission

WASHINGTON, March 4.—Holding that proposed specifications of A. O. Smith Corporation, Milwaukee, for the construction of six electrically welded multiple-sphere tank cars for the transportation of helium gas for the Bureau of Aeronautics, Navy Department, had not been shown to be in accord with the best known means for securing safety in transit, the Interstate Commerce Commission in a report made public last Wednesday withheld its approval. Present regulations permit shipment of helium at 2000 lb. per sq. in. in seamless steel cylinders or tanks, hollow forged or drawn in one piece. The Navy now owns two tank cars for helium, each of 200,000 cu. ft. gas capacity compressed to 2000 lb. per sq. in.; one bought in 1925 carries three large forged cylinders; one bought in 1929 carries 28 seamless drawn tubes, and the new cars are necessary for transporting helium for the new 6,500,000 cu. ft. dirigibles now under construction.

A. O. Smith Corporation, lowest bidder, offered to build six cars, each to weigh about 152,000 lb., and to carry 200,000 cu. ft. of helium at 2000 lb. per sq. in., for $224,280. Each car was to carry six gas containers made in the form of steel spheres. The detailed proposals called for the spherical containers to consist of two half-spheres of chrome-vanadium steel formed at the steel mill from rolled steel plates; the abutting rims were to be joined with an automatic electric welding process, and the finished container was to be carefully annealed.

Next lowest bid was submitted by General American Tank Car Corporation for six cars, each carrying 28 seamless drawn cylinders for helium at 2250 lb. per sq. in., each weighing about 208,000 lb., for an aggregate of $319,800.

Chrome-vanadium steel in the A. O. Smith proposal was to be made to conform to S. A. E. specification 6125, with the following mill tests:

Minimum ultimate strength, 85,000 lb. per sq. in.

Minimum yield point, 57,000 lb. per sq. in.

Minimum elongation in 2 in., 15 per cent.

The spheres were to be 94 in. internal diameter, wall 1 11/16 in. thick; working stresses figure to 27,863 lb. per sq. in. (assuming a joint efficiency of 100 per cent).

To demonstrate the safety of the proposed construction, A. O. Smith Corporation constructed a 6-ft. sphere of carbon steel plate 1½ in. thick, and subjected it to various severe tests, including a "train wreck" at 25 miles per hr., and subsequent bursting by over pressure. As a result of these tests a special committee from the American Railway Association approved the design and construction, but did not express an opinion as to the safety if made from alloy steel. A record of the tests were given in THE IRON AGE of Sept. 26, 1929, page 840.

Various metallurgists, who appeared before the commission at its request, testified that successful fabrication with carbon steel did not guarantee similar success with chrome-vanadium, and that the latter is more susceptible to incipient cracks than carbon steel, or to localized strains as the result of heat treatment which reduced the impact strength of the metal, which lead to the development of incipient ruptures and shatter cracks of microscopic proportions in the vicinity of the strained area.

In the summary of the evidence, the Interstate Commerce Commission appears to stress especially the fact that no welding or inspection is possible on the interior surface of the seam on these proposed spheres; that neither the bidder nor any other fabricator has had any previous experience in welding this alloy steel in very thick plates; and that the proposed factor of safety is low.

Testing Society's Steel Committee Meets

Committee A-1 on steel of the American Society for Testing Materials held its winter meeting in Philadelphia, Jan. 15 to 17. A number of sub-committees held meetings in conjunction therewith to give consideration to new test programs and to the development of new standards or the revision of existing standards. The following notes on the work accomplished should be of interest.

A revision of the present tentative specifications for tie plates is contemplated in respect to the branding to make it clear that the section is that of the plate and not of the rail, indicating that one section of tie plate might be suitable for more than one rail section.

Changes in the standard methods of chemical analysis of plain carbon steels are being considered. The carbon, manganese, silicon and possibly sulphur and copper determinations may be modified on certain types of steel. New methods for the determination of aluminum and alumina will be developed.

Agreement has been reached with the Society of Automotive Engineers for increasing the sulphur limits of Bessemer screw stock from the present range of 0.075 to 0.15 per cent to 0.10 to 0.18 per cent in the standard specifications for commercial cold-finished bar steels and cold-finished shafting in order to improve the machineability.

The committee proposes to recommend for advancement to standard the present tentative revisions of the standard specifications for billet-steel concrete reinforcement bars which revisions cover the elimination of the present recommendation that the intermediate grade be used unless otherwise specified. An increase in the allowable tensile range with no decrease in the present minimum ductility and an increase in the phosphorus limit in acid steels are involved.

Machine Knife Makers To Have Trade Conference

WASHINGTON, March 4.—Machine knife manufacturers have been authorized to hold a trade practice conference with the Federal Trade Commission. Approximately 80 per cent of the production of the industry will be represented. No time or place has been selected for the meeting, but Commissioner Charles H. March has been named to preside. The industry manufactures machine knives used in woodworking machinery, machinery for cutting paper, leather and rags, and metal cutting shears.

Westinghouse and Bendix Combine Automotive Lines

Announcement has been made by the Westinghouse Air Brake Co., Pittsburgh, and the Bendix Aviation Corporation, Chicago, of the formation of the Bendix-Westinghouse Automotive Air Brake Co., the entire capital stock of which will be held by the first named companies.

The new concern will operate the automotive division of the Air Brake company, which produces air brake equipment for buses, trucks and other types of automotive vehicles, and the corresponding departments of the Bendix corporation.

Vincent Bendix, president of the latter company, will head the new concern, and S. G. Down, vice-president of the Westinghouse Air Brake Co., will be vice-president. W. J. Buettner, treasurer of the Bendix company, will be secretary-treasurer.

Steel and Scrap Bodies to Confer on Problems

A special committee of the board of directors of the American Iron and Steel Institute will be appointed to confer with a similar committee of the Institute of Scrap Iron and Steel on direct dealing between scrap iron consumers and producers and on other matters of mutual concern, according to a letter from Charles M. Schwab, president, American Iron and Steel Institute, to Benjamin Schwartz, director general, Institute of Scrap Iron and Steel. This action follows a petition filed by Mr. Schwartz with the American Iron and Steel Institute.

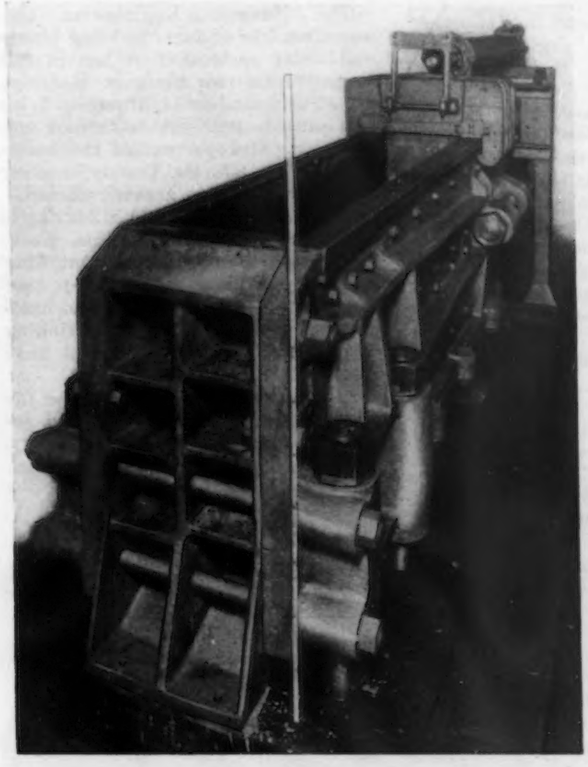
Makes Scrap Bales of 350 to 750 Lb.

Hydraulic Press Has Capacity for Handling Up to 15,000 Lb. an Hour—Box Charged Without Interference

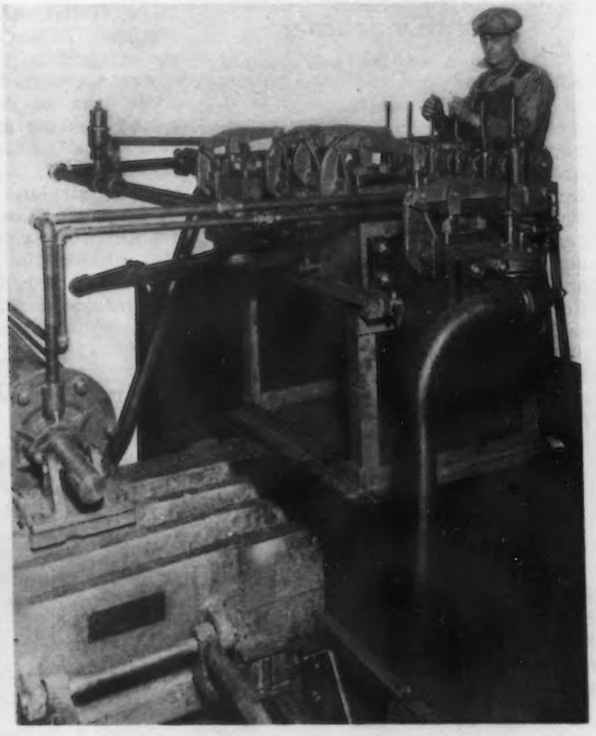
INSTALLATION of a hydraulic scrap metal baling press, which is designed with a box measuring 100 in. long by 20 in. wide by 44 in. deep, has been completed in the plant of the Allegheny Iron & Metal Co., Philadelphia. This box is constructed of steel castings, tongued and grooved together to insure close alinement. The horizontal ram is constructed of solid forged steel, operating inside a forged steel cylinder which is bored out to suit the ram. The design of the low-pressure unit is such that the hydraulic pressure is at all times confined inside of the forged steel cylinder. The packing gland is of cast steel, bronze bushed, and extends inside of the forged steel cylinder.

The high-pressure ram, which operates vertically at right angles to the low-pressure ram, is also of solid forged steel, having a cast steel rectangular head 20 in. wide by 12 in. thick and surfaced with high-carbon steel wearing plates. The vertical, or high-pressure, ram ejects the bale.

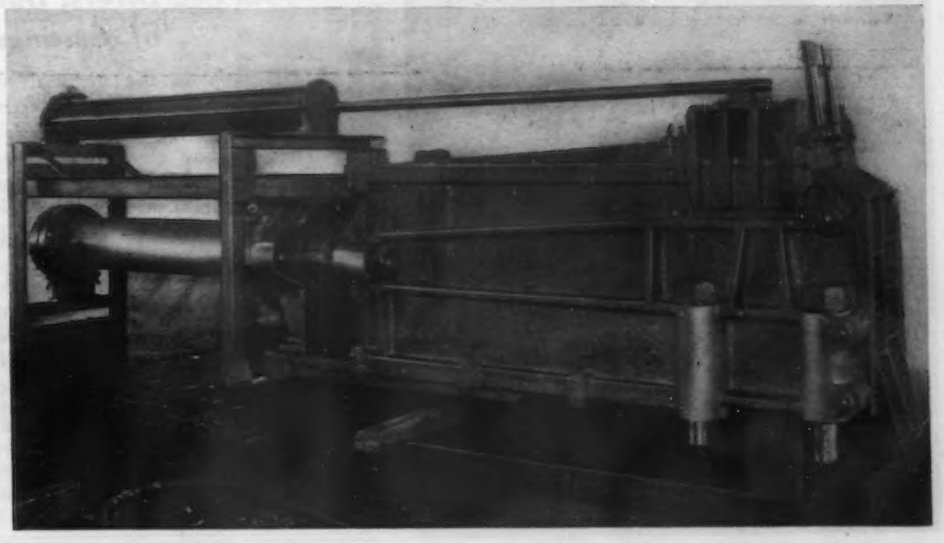
When the ram extends up into the box, the rectangular head closes the bottom opening, preventing small particles of steel falling down into the pit. Further protection is provided for the wearing surface of the ram, in that a steel canopy or baffle plate is constructed around the bottom of the rectangular head, which deflects refuse from coming in contact with



THIS Scrap Press Is Designed to Produce Bales Weighing from 350 Lb. to 750 Lb. Each. Nominal hourly capacity is 6000 to 15,000 lb. of pressed scrap metal



AIR-OPERATED Hydraulic Poppet Valves for Operating the Press. At lower left is the "head" end of the cover; just above it, one end of the air cylinder



THE Cast Steel Cover Rests on Rollers with Spring Supports. The cover is moved by the horizontal air cylinder at upper left and is gripped by the wedge flange on the box

the finished surfaces of the ram, thereby preventing scoring and sticking. Four steel tension rods are used to support the high-pressure unit.

One feature in the design of this press is that there is no overhead construction, above the top of the box, to interfere with charging the scrap material into the box prior to compression. The cast steel cover rests on rollers with spring supports, and it is moved back and forth by a horizontal air-cylinder operating at 80 to 90 lb. pressure per sq. in.

The bales produced will weigh from 350 to 750 lb. each, and the press has a nominal hourly capacity of from 6000 to 15,000 lb.

The triplex double-pressure pump is equipped with herringbone gears which run in oil. This pump operates the press at a high rate of speed through the medium of the low-pressure plungers until a given pressure is reached, at which time the pump automatically cuts into high pressure.

This press and auxiliary equipment were furnished by Galland-Henning Mfg. Co., Milwaukee.

Foundrymen Issue a New Monthly Journal

Two issues of the new monthly editions, January and February, of the *Transactions* and *Bulletin* of the American Foundrymen's Association have appeared from the press. They are attractively assembled and contain, besides general news of the national organization, items of interest regarding local foundry associations and comments and articles by officers and members of the foundry industry. Formerly a brief *Bulletin* was issued each month and the *Transactions* appeared annually as a bound volume. Papers before the national convention and some of those presented at local foundry gatherings will appear each month.

Coming Conventions of Electrochemists

For the fall meeting of the American Electrochemical Society, to be held at Detroit, Sept. 25 to 27, with headquarters at the Hotel Statler, a symposium is scheduled devoted to the "Prevention of Corrosion of Metals in the Automotive Industry." F. N. Speller, metallurgical engineer, National Tube Co., is in charge of the symposium.

Arrangements have been made for those who so desire to reach the spring meeting of the society, to be held at the Coronado Hotel, St. Louis, May 29 to 31, to go part of the distance by airplane. One session of this convention will be devoted to electrodeposition in charge of Dr. C. L. Mantell, and for another session a symposium on hydroelectrometallurgy will include copper, zinc, lead, cadmium, indium, bismuth and silver.

Institute of White Metals to Meet in Chicago

A western division of the White Metals Institute, which was organized in New York last month by leading smelters, refiners and manufacturers of white metals, will be formed at a luncheon - meeting at the Stevens Hotel, Chicago, on Friday, March 7, at 12.30 p. m. The meeting has been called by the temporary officers of the institute as a result of numerous requests from white metal manufacturers who were unable to attend the organization meeting at New York, but who recognize the need of such an institute. The principal speaker at the meeting will be Benjamin Schwartz, trade relations counsel.

The temporary officers of the institute, judging from the number of letters of cooperation that have been received from Western white metal manufacturers, state that there will be a large attendance at the Chicago meeting.

Hanover Engineering Co. Completes New Plant

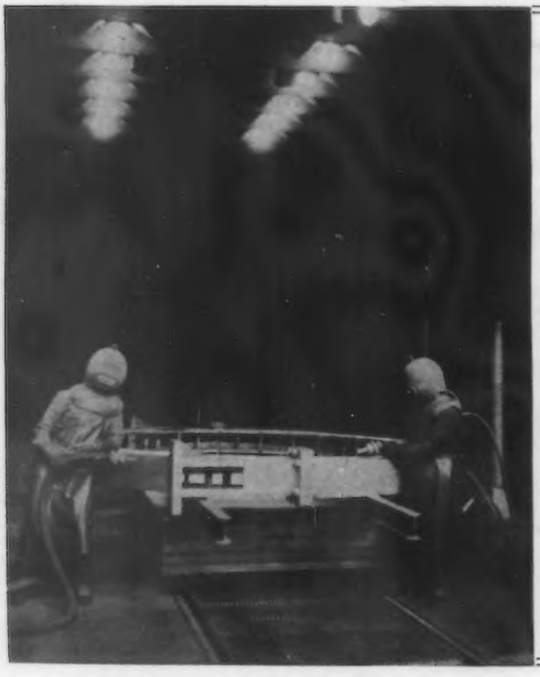
The Hanover Engineering Co., manufacturer of farm lighting plants and water systems, now has in full operation its new plant in Hanover, Pa. The building is of steel, brick and concrete, with saw-tooth roof construction. One portion of the building has two stories, the upper floor being given over to general offices.

The machine shop, 125 x 200 ft., is equipped for general machine work, including grinding. A basement, 50 x 200 ft., contains a pattern shop, pattern storage, blacksmithing and heat-treating departments, disk grinding department, etc. All machines have direct motor drive.

In addition to its regular line the company does contract work and designs and builds special machinery, aeroplane engine parts and stampings.

Bar Iron Wage Declines

The bi-monthly examination of the books of companies subscribing to the Amalgamated Association of Iron, Steel and Tin Workers discloses that the rate on bar iron for the next two months will be 1.95c. a lb., a decline of 0.05c. from the figure which has prevailed for nearly a year.



Not Sea Divers, But Cleaners of Castings

THE men in the unusual attire are not sea divers, but General Electric Co. workmen cleaning a steel casting.

The cleaning element is a very fine steel shot sprayed on the metal by compressed air at the rate of 100 lb. a minute, or 3 tons an hour. This treatment is given castings before they are painted.

The helmet worn by the workman is partly to protect his head from rebounding shot, but mainly to assure him clean air for breathing. Washed air is pumped to him as to a diver under water. The shot and the dust from the casting are carried off and separated, the shot being returned to the gun.

Crankshaft Line Bearing Lathe

Hydraulic Machine for High Production Is Built in Double-End and Center-Drive Types—Operation Automatic

FOR turning crankshaft line bearings, the Le Blonde Machine Tool Co., Cincinnati, has brought out a new hydraulic lathe designated as the 5-ACL. This machine turns the stub and flange end and all line bearings, and is furnished with two types of drive, namely, double-end and center drive.

A battery of machines consisting of one 5-ACL double-end drive, one 5-ACL center drive and one 5-AC pin turning lathe (described in THE IRON AGE of Jan. 10, 1929, page 151) will completely machine an eight-throw, nine line bearing crankshaft. Maximum production, minimum floor space and a lower cost per shaft are claimed for the new machine.

The double-end drive machine is shown in Fig. 1. The crankshafts come to this lathe centered and with locating spots milled on the webs. The work is driven from both ends by air-operated pot chucks, as shown.

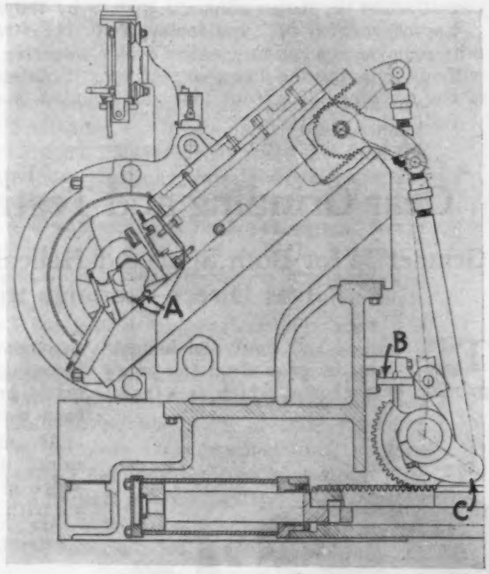


FIG. 3. Diagram Showing Features of Both Models. *A*, special equalizing clamps; *B*, tool stop; *C*, toggle arrangement for transferring motion from hydraulic cylinder to tool bars

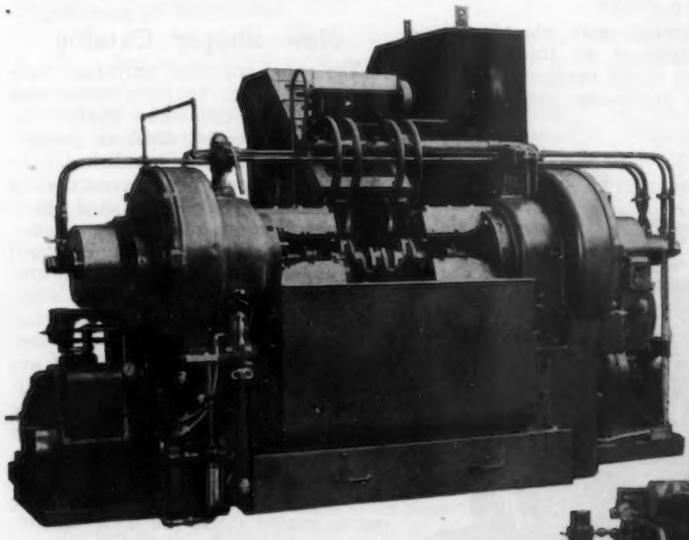


FIG. 1 (Above). Front View of End-Drive Crankshaft Lathe for Machining Intermediate Line Bearings

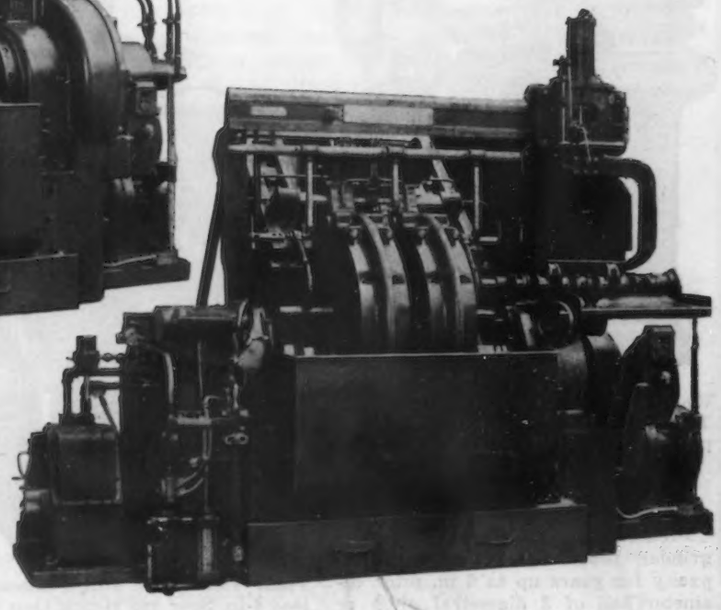


Fig. 2 (At Right). Center-drive Lathe, Showing Air-Operated Pot Chucks at Center Which Clamp the Work at Bearings Previously Turned on End-Drive Machine

The chuck spindles are mounted on Timken precision bearings. The equalizing feature of the chucks is designed to prevent springing of the crank when chucking it. The double-end drive machine turns the four intermediate line bearings.

The cranks are taken from this machine to the center-drive machine, Fig. 2, and are clamped on the web by two special equalizing clamps shown in Fig. 3, at A. The locating spots are finished so that the crank will not be sprung out of alinement. Work is located from the intermediate line bearings turned on the first machine. In being driven by both center units, the torque on the crank is reduced to a minimum. Drive is through ring gears which mesh with pinions mounted on a large splined shaft. The drive shaft is mounted on Timken precision bearings and is driven by a large gear that meshes with the motor pinion.

Tool-actuating devices in the double end and center-drive machines are the same. Layout of the tool bars is shown in Fig. 3. The hydraulic cylinder, located in the center of the machine, transfers the motion through a rack and segment to a large shaft which, in turn, actuates the tool bars by means of the toggle arrangement at the rear of the machine (C, Fig. 3). At a given piston speed, the tool speed automatically decreases as the tools approach the end of the cut. This feature gives a positive and powerful feed to the tool bars with a large displacement of oil in the hydraulic cylinder. In having the front and rear tools feed toward each other, tendency of the crank to spring is reduced to a minimum. Side thrust is taken up by heavy bronze plates secured to the unit base. These features are emphasized as permitting heavier feeds and speeds than heretofore.

To accurately reproduce size, the positive stop device, shown at B, Fig. 3, is arranged to give a dwell on the forming tools. When the segment arm strikes this stop the piston motion is stopped, and the pressure builds up to a predetermined point. A relief valve then by-

passes the oil into a small pot cylinder. This trips the Oilgear control and allows the Oilgear pump to be reversed and the machine spindle to be stopped. When the tool bars have traversed to the loading position the Oilgear pump is stopped by means of a cam plate. A dynamic control switch which reverses the flow of current to the motor stops the spindle at a predetermined position. The motor is prevented from running backwards by means of a Carpenter relay switch which automatically opens the circuit when the motor stops.

Use of vertical bit type tools permits removal and replacement of tools without changing the diameter setting of the machine. The front tool rough faces the web and finish turns the bearing, while the rear tools do the cheecking, and finish face the web.

In the double-end drive machine it is impossible to start the lathe if the air pressure falls below a safe minimum. On both types of machine it is impossible to traverse the tools into the work, since the cam plates act as positive locks to the power traverse.

In operating the double-end drive machine, the crank is placed in the pot chuck and is located by the air-operated center. The crank is then clamped by the air-operated pot chucks. The motor control switch is pressed to the starting position, and when released, it automatically drops back to running position. The traverse is then engaged. The tools traverse to the work, feed to the proper depth, and then return to the starting position, whereupon the spindle stops automatically. The air valves are then closed and the finished crank removed.

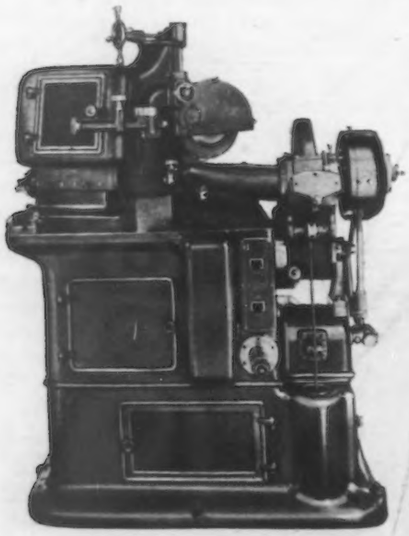
In the center-drive machine the loading operation is as follows: The crank is placed on the carrier and between the centers. The carrier is removed, the centers adjusted and the clamps locked in position. The operating cycle is the same as for the double-end drive machine.

According to the makers, production is limited only by the character of the crankshaft and tools. Average production is given as 10 and 25 cranks per hour.

Gear Grinding and Testing Equipment

Grinder Is for Both Spur and Helical Gears—Testing Unit Gives Direct Readings to 0.0001 In.

THE teeth of both spur and helical gears may be ground on the gear grinder here shown, which is a new product of the National Tool Co., Cleveland. In addition to the 4-in. grinder illustrated, which has capacity for gears up to 6 in. pitch diameter and of 3 diametral pitch or finer, the National-Cleveland machine is made in an 8 in. size for gears up to 12 in. pitch diameter and of 1 diametral pitch or finer. Gears of any helical angle up to 45 deg., right or left hand, can be ground and the machine may be adjusted for any pressure angle from 0 to 30 deg.



Working Side of the 4-In. Gear Grinder. The machine may be adjusted for any pressure angle up to 30 deg. Indexing is automatic

The machine is self contained with motors located in the base and provided with snap switch control. Four speeds of operation—32, 50, 70 and 100 strokes per min.—are available through the tumbler gear box. The indexing from tooth to tooth is automatic and takes place at the end of each return stroke.

An improved gear checking machine, designated as the model B, which gives direct readings to 0.0001 in. with a one-to-one lever arm has also been announced by the company. The lever arm is mounted on ball bearings to make it frictionless. Ball bearings are also provided for the spindle that carries the work and the base circle disks. The slide of the machine rests in one vertical V-guide and on a flat plane to reduce friction to a minimum.

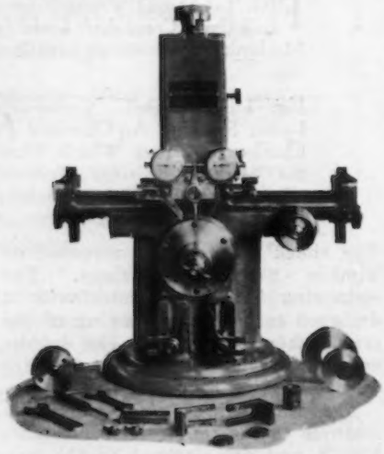
Front View of the 4-In. National-Cleveland 4-In. Spur and Helical Gear Grinder

In checking gears, gear shaper cutters, etc., repeated readings on the same tooth may be made without resetting the dial of the indicator, the same reading being obtained in each case. The machine can be used for checking involute curves and also for checking the concentricity of the involute curve tooth with the bore of the cutter by checking through an arc of 180 deg. It will also check the interspacing of the teeth. It is made in 6 and 8 in. sizes.

New Shaper Catalog

The rapid traverse, universal, railroad and utility shapers, comprising the line of the Cincinnati Shaper Co., Cincinnati, are described in general catalog N, recently published. In addition to features of construction and operation, dimensions and specifications of the machines are given.

The rapid traverse and universal shapers, identical except for the universal table, are made in eight sizes, from 16 to 36 in. The railroad shapers are the rapid traverse machines with special features, and are built in 32 and 36-in. sizes. The utility shapers, for small work, are made in 16 and 20-in. sizes, and in plain and universal models. The catalog is made up of 28 pages, 8½ x 11 in. With illustrations in colors and printing on coated stock, the material covered is attractively presented.



Gear Checking Machine Improved to Give Readings in 0.0001 In. with a 1 to 1 Lever Arm

Production High as Related to Demand

BY LEWIS H. HANEY
Director, New York University Bureau of Business Research

IT can still be said that there is a fairly close adjustment of steel production to the country's requirements as indicated by our composite measurement of the activity of the chief consuming industries. The adjusted production curve was a little above the demand curve in both December and January, but one must allow for a considerable margin of error in such computations.

It may well be doubted whether this condition is as favorable as might be supposed under other circumstances. For example, it will be noted that January, 1930, was the first January since 1925 in which the demand curve has not been above the curve of production. More significant still is the fact that in 1921, 1924 and 1927, at the bottoms of the business recessions which ended in those years, steel production fell considerably below the level of the demand curve. This condition has not yet arisen in the recession of 1929-1930.

Our composite demand line, which we take to be an indicator of steel requirements, moved up in January, the rise being due to gains in adjusted indexes of automobile production, general manufacturing, machine tool orders and the like. These gains more than offset declines in building contracts (floor space), mining activity, agricultural conditions, and exports. The demand index for January was 104.2 per cent of the average for the years 1921-1927. The increase is confirmed by a large gain in January orders for finished steel.

Steel ingot production (adjusted for seasonal variation) was 110.2, which compares with 97.9 in December. (The figures in the chart are shown on the basis of their average deviations from the 1921-'27 level, each series being so adjusted that their fluctuations are similar in amplitude.)

The future of the demand curve seems quite uncertain. The *railroads* have been active buyers of steel and have probably done more than their share. In view of the relatively low level of freight traffic and the continued poor showing as to net operating income, it seems unlikely that the carriers will be able to continue the pace even if their most urgent requirements have not been met.

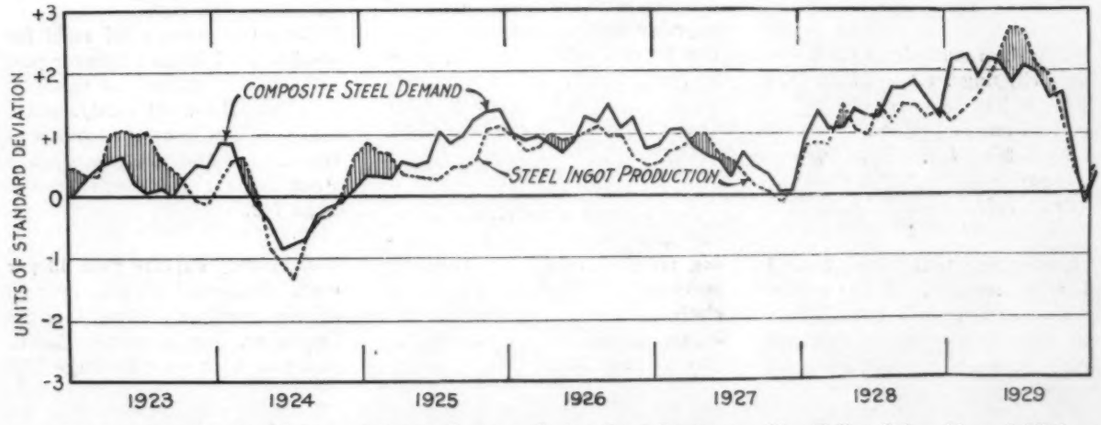
No considerable improvement in *building* activity is yet in sight. There is a rather general scarcity of money for building purposes and builders are obviously hesitating to invest their funds under present conditions. Moreover, it will take time for contemplated construction projects to develop into the steel buying stage.

Nor is the *automobile* outlook promising. Little progress appears to have been made in February. The cheaper, lighter cars requiring less steel will predominate.

General manufacturing, exclusive of steel and automobiles, hardly made more than a bare seasonal gain in January. The trend of iron and steel *exports* has been downward for some months and does not seem likely to improve in the absence of foreign financing on our part. The production of *agricultural implements* has long been sustained at a high level and, if anything, is likely to slacken, particularly in view of unfavorable farm prices.

In general, however, we find a fairly large volume of railroad equipment on order and the steel fabricators fairly well booked, so that it seems that there is enough steel business under contract and prospects of enough new business to sustain the volume of steel production at a level not far from that now existing.

Judging by the promptness with which steel production has been adjusted to requirements during the past few months, it does not seem likely that there will be any considerable over-production. February should come close to showing the normal seasonal gain over January, which is nearly 5 per cent. March, however, looks more doubtful. Probably the most that can be hoped for is a period of several months of dullness in general business during which steel production may be expected to decline moderately and steel prices show little change.



For the First Time in the History of Recent Business Cycles, Steel Production Has Fallen Below Normal Without Also Falling Below the Indicated Current Demand. It probably should

This Issue in Brief

New copper alloy can be forged at black heat without cracking. P.M.G. metal has 2 per cent iron, 3.4 per cent silicon and 2 per cent zinc. Has high tensile strength, considerable elongation and pronounced resistance to abrasion.—Page 727.

* * *

Little change in steel prices, moderate decline in steel output, and several months of dullness in general business, Dr. Haney's forecasts.—Page 731.

* * *

Holds quenching oil temperature automatically at desired point by means of pipe coils in tank. When oil is too warm, cold water circulates through the coils. When oil is too cool, the flow of cold water is automatically cut off.—Page 704.

* * *

Prevents formation of pipe in aluminum ingots by slowing up the "freezing" process. Ingot mold is slowly lowered in pit, which has oil burners in upper half and water sprays in lower. —Page 707.

* * *

Iron production of world in 20 years will be at least 10 times that of all non-ferrous metals combined, Zay Jeffries predicts. Iron and steel is basically well fortified, he says, against competition from either metallic or non-metallic materials. — Page 720.

* * *

Gray iron made from steel borings, clippings, etc. Shaft type furnace has three electrodes at top and one at bottom. Furnace shaft is filled with coke. Product is superior to blast furnace iron. —Page 725.

* * *

Quenching tank fire hazard sharply reduced. Fire extinguisher with fusible links blankets the bath with a chemical spray in case of fire.—Page 704.

No industrial health without proper reward to the individual, says Zay Jeffries. Potentially large rewards, size to be determined by experience, is required to stimulate the individual to greater production.—Page 722.

* * *

Don't nullify the painstaking care of the anti-friction bearing manufacturer by careless handling or mounting of the bearing. If the fit is too tight, don't handscrape the bearing set, for that will produce out of roundness. If the shaft is worn, don't shim the housing instead of boring it to receive a bushing.—Page 706.

* * *

Aluminum structural material, when heat treated, has physical properties comparable with those of mild steel. Aluminum shapes are recommended for use where saving of dead weight is important. Net weight saved is about one-half.—Page 707.

* * *

"Aggressive research and development" prescribed for steel industry. Should keep pace with similar activities in other industries, to ascertain applications where iron and its alloys can serve most economically.—Page 720.

* * *

To substitute for expensive bronzes, new hardened copper, of superior ductility is offered. It can be cast into wet or dry sand or metal molds. Fluid, clean, can be cast in thin sections; does not scale in air, and is easily cleaned. —Page 727.

* * *

Don't leave anti-friction bearings exposed to dirt and grit during mounting. Protect them by covering with clean paper or cloth, or foreign matter will get in, and prematurely wear out the races.—Page 706.

Makes artificial manganese ore by charging manganiferous iron ores into blast furnace, producing a high-phosphorus spiegel with 10 to 15 per cent manganese. Spiegel is then charged into open hearth furnace and a slag of 55 to 70 per cent manganous oxide is produced.—Page 724.

* * *

Making welders out of riveters not easy, Baldwin finds. When tender tanks were changed to welded construction, it was decided to train the more competent tank makers in welding, rather than engage expert welders. However, the change-over has been made and work is now satisfactory.—Page 715.

* * *

Moisture content of sand is very important in making steel castings in green sand. If moisture is over 4 per cent add more dry sand and remix. If under 4 per cent add water and remix.—Page 711.

* * *

Welded construction presents new problems in how to dispense with bolts for temporary fitting-up needs. Should holes be punched for erection bolts, and later plugged with filler metal? Baldwin finds it impracticable to eliminate holes entirely, but finds that a temporary fitting-up bolt welded on is a good substitute in part.—Page 716.

* * *

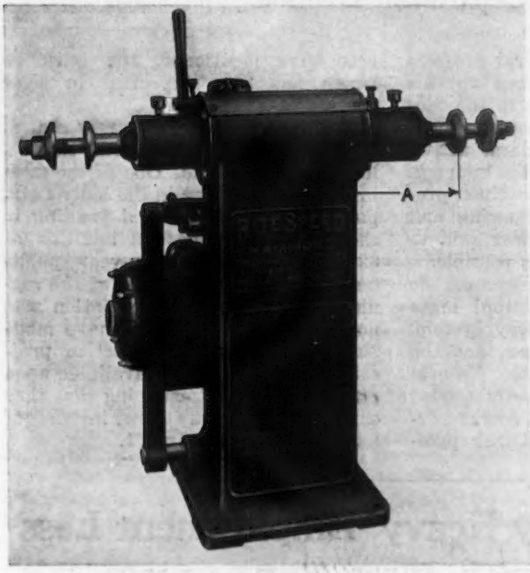
Gate the green sand mold for steel at the bottom whenever possible. This allows the metal to flow into the mold softly, which reduces the wear on the surface of the mold. Blow-holes are fewer when bottom gates are used.— Page 712.

* * *

Machinery exports gain 13 per cent. January total was over 56 millions, against 49.6 millions for December, and was the fourth best month on record.—Page 766.

Motor-Driven Polishing and Buffing Lathe

SPINDLE speeds of 2000 r.p.m. for polishing, and 3000 r.p.m. for buffing, are obtainable merely by changing the motor pulley on the polishing and buffing lathe illustrated, which is a new product of the Hammond Ma-



Suitable Speeds for Polishing and for Buffing Are Obtained by Changing the Motor Pulley. A combination switch and brake is a feature

chinery Builders, Kalamazoo, Mich. This machine, designated as the Rite Speed, type C, is intended for alternating current motor drive.

The motor is mounted at the rear of the pedestal base and drives the spindle through multiple-V belt. It is claimed that with this mounting of the motor large batteries of the machines can be placed with minimum floor space requirements and without sacrificing clearance around the spindles. Belt tension adjustments are made by means of a single adjusting nut without disturbing the motor mounting. The motor is entirely inclosed, is adequately ventilated and is fitted with an air cleaner to protect the windings from dirt and grit.

Belts may be changed conveniently by removing the four large cap screws on each side of the spindle and moving the spindle from the pedestal, which can be done without disturbing the bearing mounting or the sub-assembly parts. The motor adjustment screw is then loosened and the belt slipped off the spindle.

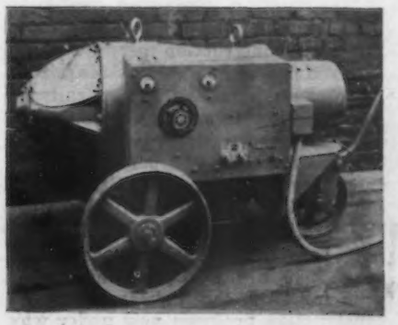
A combination switch and brake is employed on the machine. With this it is only necessary to pull the lever forward to break the current connection and apply the brake. By reversing this operation the brake is released and the motor started. The machine may be equipped with either Timken roller bearings or ball bearings. Automatic motor starter, flat top threads and spindle lock are standard equipment. The machine can be supplied with any standard motor specifications in a complete range of sizes from 3 to 15 hp.

Flexactor Smooths Surges in Welding Current

A NEW principle has been incorporated in electric arc-welding machines by the Westinghouse Electric & Mfg. Co., East Pittsburgh, which enables the operator more easily to strike and maintain the arc under all operating conditions. The development, designated as the Flex-arc principle, is now applied to the company's line of single operator welders. It consists of a special piece of apparatus known as a Flexactor, instead of the reactor formerly used.

Although the volt-ampere curve of a welding generator indicates a certain current for a given voltage, it is well known that such a current is not obtained at all times. For instance, in striking the arc, the current far exceeds the rated value. The chief function of the Flexactor is to prevent this overshooting of current and resultant tendency of the electrode to stick.

In older types of machines, any lengthening of the arc causes the current to drop momentarily below the normal steady value, thus interrupting the arc. This also is corrected by the Flexactor. In the arc welding process, momentary short circuits are caused by globules of metal passing across the arc; such short circuits result in current surges and arc explosions just as when striking the arc. This explosive action is said to be eliminated by the use of the Flexactor to the extent obtained with six or eight ordinary reactors, yet with ohmic resistance not materially greater than that of one reactor as formerly used.



Light Weight and Compact Flexactor Is Mounted Directly Under Unit Frame

High-Temperature Torch for Small Scale Testing

OXWELD ACETYLENE CO., New York, has developed a special torch (appearing much like an oxy-acetylene blow-pipe) which uses dissolved acetylene and compressed air. It is especially suitable for laboratory work, for the flame may be changed from the brush type to a needle point by adjusting the air supply, by a twist of a valve stem. The brush, or Bunsen flame, has a temperature of approximately 2800 deg. Fahr., and the needle point flame one of approximately 3300 deg. Fahr., making it suitable for any work requiring high temperature, and providing a range of heat in many metals from near melting to the molten stage, and even boiling stage.

Other auxiliary laboratory equipment consists of a small tank of dissolved acetylene, a hot plate, a Bunsen burner, a reducing valve, a three-way branch valve, and the necessary red gum tubing. With this outfit all manner of laboratory tests can be undertaken.

Regulates Welding Current by Turning Handle

GENERAL Electric Co. is building 200, 300 and 400-ampere welders (N. E. M. A. rating for 1 hr., at 25 v., 50 deg. C. temperature rise) known as Type WD-200 A, Type WD-300 A and Type WD-400 A respectively. They are normally furnished direct connected to an alternating current motor with enclosed starting box (push button operated), but are also built for belt or gas engine drive. The two smaller sizes weighing 1825 and 2150 lb. are usually mounted on a truck, and the biggest one, weighing 2425 lb., on a steel base. Steel canopies with canvas side curtains for protection against the weather is optional equipment for all models.

Ruggedness, strength and reliability have been given first consideration in the design and construction of this equipment. Shafting is mounted on ball bearings. The generator is provided with a brush-shifting device which regulates the welding current by infinitely small gradations simply by turning an external handle. A steady arc is maintained by an exclusive feature known as the "self-adjusting stabilizing reactor," a specially designed magnetic circuit without any moving parts.

Public Works Program Now $3,500,000,000

Projects, Here Classified, for Larger Total Than Any Peace Time Year—Work Being Expedited by New Commerce Department Division

WASHINGTON, March 4.—Public construction, including repairs and maintenance, will involve an expenditure of about $3,500,000,000 in 1930, based on estimates of Federal, State, municipal and county officials, according to Dr. John M. Gries, chief, Division of Public Construction, Department of Commerce. This division was created by Secretary of Commerce R. P. Lamont at the request of President Hoover, to act as a clearing house for efforts to expedite all governmental construction programs.

Reports from governors show total estimated expenditures for public works during the current year in excess of $3,100,000,000. This includes State, municipal and county projects. The Federal government program will amount to some $275,000,000, subject to some increase, depending upon Congressional action. The figure given by Dr. Gries for the Federal government does not include its contribution of $80,000,000 or more to Federal highway aid, since that was incorporated in State estimates.

Everywhere, public officials responsible for construction are initiating work that had been planned and are trying to remove restrictions so that work may go ahead uninterruptedly and at an early date, it was stated. Tentative estimates, subject to revision, have been made of projects of public construction, which bring the total to $3,585,000,000, but give a rather liberal application to the term "construction."

Dr. Gries declared that it may be stated with confidence that highways and streets constitute more than one half of the total. Reports indicate clearly, it was stated, that the whole program for 1930 is larger than that of any other peace time year. Examples were cited to show prompt action on the part of governors and were declared to be typical of steps being taken throughout the country.

In addition to the Federal projects under way and to be taken up this year reference was made to the ten-year program for new postoffices and the housing of other Federal activities in cities throughout the country. Building activities under that program are not yet in full swing and the immediate objective was said to be to push it as rapidly as possible.

The army housing program, the completion of the Mississippi main trunk and lateral waterway system, the Mississippi flood control, and the construction of adequate Federal prisons are among the badly needed projects upon which the Federal government has embarked. Other projects were mentioned, the work on which has been expedited in some cases.

Congress has enacted or is considering several legislative items that relate to public works. One of the most important, provided in the Elliott bill, passed by the House and pending in the Senate, provides an addition of $230,000,000 to the ten-year public building program. Several of the regular departmental appropriation acts now pending in Congress have made funds for certain construction projects in the 1931 budget available upon passage of the act, meaning that they can get under way now instead of having to wait till July 1.

Estimates, as made by Dr. Gries, follow:

All types of buildings, of which schools constitute the largest item, $800,000,000.

Rural highways and city streets, including some maintenance, $1,900,000,000.

Publicly owned utilities, including waterworks and sewers, $370,000,000.

Waterways, including maintenance of existing channels, drainage and reclamation, $275,000,000.

Floating equipment, including naval vessels, $80,000,000.

Miscellaneous, $160,000,000.

Utility Outlay Heavy, Employment Less

Expenditures of Public Utilities to Exceed November Estimate—A. F. of L. Reports More Out of Work

WASHINGTON, March 4.—Public utility expenditures to be made during 1930 are estimated at more than $1,400,000,000, affecting every city and town in the United States, according to a report made to President Hoover by Matthew S. Sloan, chairman of the committee on expedition of public utility construction, and made public by the President last Saturday. The statement was given out at the same time that William R. Green, president of the American Federation of Labor, made public a survey of labor conditions in 24 cities showing a 2 per cent decline in employment in February under January.

The report made by Mr. Sloan, who is president of the Brooklyn Edison Co., said that a recanvass indicated that the program of the public utilities industry, as detailed at the National Survey of Business Conferences last November, probably would be expanded somewhat.

"Information completed yesterday indicates that the total expenditures for new construction already made this year or to be made by March 31, by electric, gas and street railroad companies, will aggregate $305,000,000," said the report.

"This amount is 12 per cent higher than corresponding expenditures during the first quarter of 1929. Since the total estimated expenditures for new construction during the entire year 1930 are 8½ per cent higher than for 1929, this indicates that the construction program now under way has been accelerated."

Of the total $865,000,000 to be expended by the public utility companies for new construction, $465,000,000 will be in orders with manufacturers and producers of equipment and construction materials, with corresponding acceleration of factory employment, according to information given to the committee by the public utility interests. It was added that a large proportion of the $400,000,000 will be expended for local labor. The declaration was made that the volume of new orders for equipment and materials already placed or to be placed by March 31 will be $180,000,000, or 38 per cent of the year's total. This was pointed to as indicating positive and accelerated progress in the new construction program.

The statement of Mr. Green said that the most serious condition is in the building trades "where 43 per cent were out of work in February, 1930, as against 38 per cent in January and 33 per cent in February, 1929." The report, which covered 670,000 trade union members, said that there were 4 per cent more unemployed last month than in February, 1928, the worst month for building tradesmen two years ago. In the metal trades, it was stated, unemployment increased from 15 per cent in January to 18 per cent in February. Only once before, it was added, has unemployment in metal trades reached such a high level since the Federation has gathered figures, and this was in January, 1928. The summary said that preliminary figures for February showed that 22 per cent of the members were idle.

Handling Materials at Blast Furnace

Important Developments Will Include Charging Facilities —Stack Size Trend Also Covered at Pittsburgh Meeting

THE most important developments in blast furnace practice in the immediate future will result from improved handling of materials in the stock pile and in charging. On this note of prophecy, introduced by A. J. Boynton, vice-president H. A. Brassert & Co., Chicago, members of the Eastern States Blast Furnace and Coke Oven Association, meeting on Feb. 28 at the William Penn Hotel, Pittsburgh, discarded minor differences of opinion to come to general agreement.

Mr. Boynton's statement arose from a discussion of the sizing of coke for blast furnace use, which had narrowed itself to a symposium on the methods of utilizing nut coke passed over a 1-in. or smaller screen. It was generally agreed that the best results are obtained by charging the nut coke separately and many of the members were able to relate more or less disastrous experiences which had arisen from improper segregation of the coarser and finer materials in filling.

It was the opinion of Robert McEldowney, superintendent of blast furnaces, Cambria works, Bethlehem Steel Co., Johnstown, Pa., who presided at this session, that coke should be screened twice, first at the ovens over a comparatively large screen and later just before charing at furnace over a finer screen.

What Size Furnace?

As usual at meetings of this association the relative merits of stacks of large dimensions were subject to considerable discussion. The question of the other dimensions best suited to a stack with a 25-ft. or wider hearth developed considerable difference of opinion. Suggestions for height ranged all the way from 90 to 105 ft., with many diverse opinions as to the size of top, bosh, lining and bell. Apparently this is a subject which blast furnace men find particularly perplexing, but also one which all readily admitted might face them at any time.

It was agreed that the trend toward larger stacks could not be denied, but majority opinion seemed to favor a stack of less extreme dimensions, under the assumption that the desired heavy tonnage production might be realized on a stack with, say a 22-ft. hearth, if the furnace were properly operated. It was said that one steel company stack with a hearth 22 ft. 3 in. in size was averaging 960 tons daily, a figure not far below the records of furnaces with hearths 25 ft. or larger.

The possibilities of improved charging practice were conclusively shown by the case of another steel company stack, the output of which had been increased by more than 100 tons daily by the installation of proper coke screening equipment.

Some of the general advantages of the larger furnace were summed up by J. E. Lose, assistant general superintendent, Homestead works, Carnegie Steel Co., Munhall, Pa. Mr. Lose pointed out that the larger stack is less subject to irregularity in operation caused by faulty materials than the smaller and also that blast pressures are uniformly higher in the larger stack. He also suggested the possibility of utilizing stronger coke in the large-sized furnace and indicated that increasing the strength of coke was one of the more important problems of the coke oven operating men today.

This led to a discussion of the relative merits of very wide by-product ovens and C. R. Meissner, superintendent of coke plants, Weirton Steel Co., Weirton, W. Va., discussing the subject generally, stated that he favored a 16-in. oven, as an average. He pointed out that ovens up to 18½ in. are difficult to regulate, while a 14-in. oven, although capable of very close regulation requires considerably closer control.

Cost of Cleaning Furnace Gas

Discussion of the cost per ton of pig iron of cleaning blast furnace gas to 0.4, 0.15 and 0.02 grain per cu. ft. was based largely on the experience of individual companies and was necessarily of a confidential nature. It was brought out, however, that companies which have adopted innovations in gas cleaning the last two or three years are more than satisfied with the results obtained and that recent developments in this field have opened wide possibilities for further refinements in blast furnace practice.

Improve Metal Ladles and Mixers

Improvements in hot metal ladles and mixers have recently resulted in innovations in linings. It was pointed out that one company has had considerable success with mica schist linings in its mixers. In this material the ends of the laminations are laid opposite to the pressure of the metal and thus good results have been obtained. The higher temperatures in modern mixers has emphasized problems of linings in recent years and old types of refractory materials are no longer adequate.

Use of the comparatively new Pugh and Kling hot metal ladles has aroused considerable interest and the experience of companies which have adopted one or the other proved generally satisfactory. One user of the Kling ladles of the inclosed top type had averaged 60 to 65 tons per ladle over a two year period without new lining. A mica schist lining with a brick top had proved most satisfactory in this application. It was indicated that the scrap loss was reduced by this type of ladle, although partially dependent upon skimming. Users of the Pugh ladle also reports low scrap losses, although this is of course regulated partly by the length of time the hot metal is allowed to remain in the ladle.

Sharp Drop in Imports of Pig Iron

Pig iron coming into the United States in January was only 9080 gross tons, compared with 17,172 tons in December and with 16,108 tons in January, 1929. The incoming tonnage in January was the smallest since last July and was exceeded by nine individual months of 1929 and ten months of 1928.

More than half of the tonnage, as in December, came from British India, whose percentage was run up to 63. Great Britain furnished two-thirds of the remainder. The Netherlands, which provided nearly one-fourth of the December total, dropped to less than 4 per cent in January. Sweden was the only country showing an increase, the incoming tonnage from that source having been more than doubled.

"Investigation of Endurance of Bond Strength of Various Clays in Molding Sand" is the title of Bulletin No. 200, engineering experiment station, University of Illinois, Urbana, Ill. The authors are Carl H. Casberg, manager, shop laboratories, and William H. Spencer, superintendent, foundry laboratory.

UNITED STATES IMPORTS OF PIG IRON BY COUNTRIES OF SHIPMENT

(In Gross Tons)

	January, 1930	December, 1929	January, 1929
United Kingdom	2,158	4,002	5,250
British India	5,884	8,798	7,315
Germany	....	....	3
Netherlands	353	3,760	3,091
Canada	....	45	164
France	....	....	....
Belgium	....	....	151
Norway	147	307	51
Sweden	535	260	50
All others	3	....	33
Total	9,080	17,172	16,108

Division of World Markets Progressing

American Participation in European Plan Comprehended—British Reorganizing Shipyards to Eliminate the Unnecessary and Obsolete

(*By Cable*)

LONDON, ENGLAND, March 3.

PIG IRON is dull, with Cleveland makers maintaining prices and consumers covering only their immediate requirements. Stocks of pig iron are increasing as the steel output declines, and blowing out of some blast furnaces is probable.

Hematite iron producers are shading prices, but consumers are not attracted.

Finished steel is quiet, especially for export and mills rolling heavy material are operating irregularly.

British consumers of Continental semi-finished iron and steel are showing interest in buying, but business, so far, has been insignificant, as the Continental situation is still unsettled by the International Steel Cartel's deliberations and uncertainties as to the positions of merchants and agents.

Tin plate is quiet, but inquiry is widespread, indicating accumulating requirements. Many mills are sold to the end of June and asking full prices, but concessions are still granted by other mills seeking to fill up on certain deliveries.

Galvanized sheet makers have reimposed the minimum price for heavy gages, making the market stronger, but demand is still small as Indian buyers are not interested with large stocks in Calcutta. Black sheets are quiet in the Far Eastern sizes, but there has been some improvement in heavy gage sheets.

The National Shipbuilders Security Co. has been formed to reorganize British shipbuilding by eliminating unnecessary and obsolete shipyards and concentrating yards in the most suitable localities. This is expected to effect great economies, permitting the restoration of financial stability to the industry, which has become much impaired through subsidized foreign competition.

The French Government has agreed to permit export to Great Britain in 1930 of 25,500 tons of iron and steel scrap and 4500 tons of new crop ends in equal monthly quantities.

Negotiations have proceeded between the International Steel Cartel and the principal American producers with view to mutual production control. An understanding may possibly be reached to restrict competition in certain markets.

French output in January was 876,000 metric tons of pig iron and 804,000 tons of raw steel. Belgian output was 343,000 metric tons of pig iron, 330,000 tons of raw steel and 296,000 tons of rolled steel.

German steel output in January was 1,275,000 metric tons of raw steel and 896,000 tons of rolled steel. Luxemburg production was 250,000 metric tons of pig iron and 216,000 tons of raw steel.

British Iron and Steel Market Quiet

Pig Iron Users Seek Lower Prices Because of Reduced Fuel Costs—Mills Rolling Heavy Steel Need Tonnage

LONDON, ENGLAND, Feb. 15.—Although there have been reductions in the cost of fuel, pig iron producers still are unable to pass them on to consumers, who are consequently buying only for immediate requirements. The Scottish Light Castings Association is now considering placing its annual order for about 10,000 tons of pig iron, but the Continent is competing for the business and there is a possibility that it may not come to British makers this year.

Demand for steel has diminished and steel output is being curtailed, so that there is but little prospect of an improvement in pig iron demand, although, so far, pig iron production has not been materially affected. Most of the present output of iron is being absorbed, but a certain tonnage is going into stock and, if the present dullness continues, it is evident that production must be curtailed. Hematite iron producers are becoming embarrassed by heavy stocks,

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British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at $4.8665 (par)

British Prices f.o.b. United Kingdom Ports

Cleveland No. 3 foundry	£3	12½s.	to	£3	13½s.	$17.64	to	$17.88
East Coast hematite	3	17½	to	3	18	18.86	to	18.98
Ferromanganese, export	12	5	to	12	10	59.61	to	60.83
Billets, open-hearth	6	2½	to	6	12½	29.81	to	32.24
Sheet bars, open-hearth	5	17½	to	6	5	28.59	to	30.42
Black sheets, Japanese specifications	12	5				59.61		
Tin plate, per base box	0	18¼	to	0	18¾	4.43	to	4.55
Rails, 60 lb. and heavier	7	15	to	8	15	37.72	to	42.58
						Cents a Lb.		
Steel bars, open-hearth	8	0	to	8	10	1.74	to	1.85
Beams, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Channels, open-hearth	7	12½	to	8	12½	1.66	to	1.87
Angles, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Ship plates, open-hearth	7	15	to	8	5	1.68	to	1.79
Black sheets, No. 24 gage	9	15	to	10	0	2.12	to	2.17
Galvanized sheets, No. 24 gage	11	17½	to	12	5	2.57	to	2.60

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 0.50 to 0.90 per cent phos.	£3	6s.	to	£3	10½s.	$16.06	to	$17.15
Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	3	4	to	3	5	15.58	to	15.82
Billets, Thomas	4	13	to	4	14	22.63	to	22.87
Sheet bars, Thomas	4	13	to	4	15	22.63	to	23.12
Wire rods, low C., No. 5 B.W.G.	6	2	to	6	4	29.69	to	30.19
Rails, 60 lb. and heavier	6	8½	to	6	10*	31.27	to	31.63
Rails, light	6	0				29.20		
						Cents a Lb.		
Steel bars, merchant	5	7½				1.18		
Steel bars, deformed	5	6½	to	5	7½	1.17	to	1.18
Beams, Thomas, British standard	5	3	to	5	6	1.12	to	1.17
Channels, Thomas, American sections	5	12	to	5	14	1.24	to	1.26
Angles, Thomas, 4-in. and larger, over ⅜-in. thick	5	6				1.17		
Angles, Thomas, 3-in.	5	7½				1.18		
Ship plates open-hearth inspected	7	3	to	7	5	1.56	to	1.60
Black sheets, No. 31 gage, Japanese	12	2	to	12	3	2.67	to	2.68
Hoop and strip steel over 6-in. base	5	15	to	5	17½	1.25	to	1.28
Wire, plain, No. 8 gage	6	10				1.42		
Wire, galvanized, No. 8 gage	8	5				1.79		
Wire, barbed, 4-pt. No. 12 B.W.G.	10	17½				2.36		
Wire nails, base	6	15				$1.47 a keg		
Wire nails, assortments 1 to 6-in. keg	10	5				2.22		

*Open-hearth steel, 8s. ($1.95) a ton extra.

despite substantial shipments to Italy and other European countries.

Some steel mills rolling light-weight material are well engaged on domestic orders, but producers of heavy material are in most cases in need of tonnage. Domestic construction and engineering contracts are bringing them some business, but shipbuilding specifications have diminished, and certain mills have been forced to operate on part-time schedules. Export demand, particularly, is small, except for some special orders from Colonial Governments. It is, therefore, of more than ordinary importance that both India and Japan are considering increases in duties on iron and steel of certain specifications.

Rationalization of the British iron and steel industry is progressing and a merger in Lancashire is about completed. The companies involved are the Wigan Coal & Iron Co. and the Pearson & Knowles Coal & Iron Co. The latter has four subsidiaries: Partington Iron & Steel Co., Moss, Hall Coal Co., Wigan Junction Collieries and Rylands Brothers.

Germany to Build Greek Telephone System

HAMBURG, GERMANY, Feb. 17.—A contract has been made by the Government of Greece with the Siemens & Halske A.G., Berlin, for the construction of a complete telephone service and its management for a period of 38 years. The Siemens & Halske company will furnish about 16,000 tons of cables and 2500 tons of telephone wire. During the period of operation the company will pay the Government 8 per cent of the gross profits.

Cartel Export Curtailment Fails to Strengthen Prices

HAMBURG, GERMANY, Feb. 17.—The recent decision of the International Steel Cartel to have all members except Belgium suspend export business temporarily has not brought about the expected increase in export prices. France, Germany and the Saar rejected all export orders in the week of Feb. 10, and Germany did not resume selling until Feb. 19. However, a speculative buying movement did not develop, and the immediate needs of consumers were easily satisfied by Belgian mills or Continental merchants from their heavy stocks.

The dispute between exporters and merchants and the International Steel Cartel on the amount of discount to be granted from market prices has been settled. The discount of 1s. to 1s. 6d. (24c. to 36c.) according to the size of the order has been increased to 2s. to 2s. 6d. 48c. to 60c.) per ton. The discount of 500 tons of steel bars will be 2s. and on 300 tons of shapes will be 2s. 6d. per ton.

It is generally believed that the cartel will soon adopt c.i.f. quotations on most of its products, but only for Great Britain and the Continent. Penalties fixed by the cartel for members exceeding their export allotments by more than 5 per cent are 15s. ($3.65) per ton on steel bars, hoops, beams and semi-finished material and 10s. ($2.43) per ton on plates.

German Wire and Nails Sold in United States

HAMBURG, GERMANY, Feb. 17.—Recent reductions in the export prices of wire nails and barbed wire have stimulated the business of German mills with Pacific Coast and Gulf ports. Exporters here have been able to book a fair tonnage of wire nails and barbed wire, Waukegan type No. 12½ B.W.G. The total amount of this business with the United States in the opening weeks of the year has been better than in the same period of 1929.

Quotations have been $2.72 per 100 lb. for Waukegan type barbed wire No. 12½ B.W.G., c.i.f. Houston, Tex., New Orleans or Mobile, Ala., and $2.80 per 100 lb., c.i.f. San Francisco. On wire nails in assortments from 1 to 6-in. the quotation has been $2.28 per 100-lb. keg, c.i.f. Gulf ports, and $2.30 per 100-lb. keg, c.i.f. Pacific Coast ports, packing included.

German Exports of Steel Increased in January

WASHINGTON, March 4.—Exports of iron and steel products from Germany in January increased to 459,682 metric tons from 417,900 tons in December and imports increased to 110,739 tons from 101,508 tons, according to a cablegram to the Department of Commerce from Berlin.

The number of blast furnaces in operation at the end of January, 95, was the same as at the end of December. Production declined, however, to 1,092,206 tons from 1,100,378 tons, the rate of operation being 66.8 per cent of capacity. Output of raw steel increased to 1,275,023 tons from 1,156,105 tons in December.

Iron Ore Deposits Found at Lakeland, England

Prospecting in Lakeland, England, has led to the discovery of exceptionally fine quality iron ore near Red Tarn, close to the old Roman road over Wrynose Pass, between Ambleside and Eskdale. Initial tests have shown a good grade of ore and borings are to be taken.

Chase Companies, Inc., Waterbury, Conn., announce a change of name to Chase Brass & Copper Co.

European Mills to Control Sales to United States

DÜSSELDORF, GERMANY, Feb. 15.—Officials of the International Steel Cartel deny that any agreement for restriction of steel production is being negotiated with American mills, pointing out that there is no organization in the United States qualified to make and enforce such a contract. It is understood, however, that discussions are taking place concerning the possible extension of the present agreements of the International Rail Makers' Association on rails and of the tube syndicate on pipe.

If negotiations are successful, the agreements will probably include hoops and bands, certain sizes of structural material, and wire rods. It is believed that any such agreements would deal definitely with Continental steel exports to the United States, stipulating that European mills sell at certain minimum prices not subject to concessions, especially on the Pacific Coast.

European Manganese Ore Stocks Large

HAMBURG, GERMANY, Feb. 17.—European stocks of manganese ore are heavy, with demand inactive. The Soviet Government is shipping 100,000 tons of Georgian manganese ore to Rotterdam on consignment for sale to European consumers. In 1929 most users bought more than usual. Great Britain imported 289,300 tons, compared with 206,000 tons in 1928, Germany 381,700 tons, compared with 291,665 tons in 1928, and Belgium and Luxemburg together 362,700 tons, compared with 328,000 tons in 1928.

German Aluminum Sheet Output Delayed

HAMBURG, GERMANY, Feb. 10.—Commercial production of aluminum-coated sheets by the Hoesch Steel Works at Stockheide has been delayed and probably will not begin before summer. The mill at Stockheide has been completed and a small tonnage of aluminum-coated sheets has been produced for trial shipments to exporters and consumers. The Government Institute of Hygiene is subjecting these sheets to tests for food containing. Meanwhile, certain changes have been made in the equipment of the plant, which will have a rated capacity of 300,000 tons a year. For making this product the Hoesch works uses a No. 31 gage steel sheet, which is coated with pure aluminum.

Russia Plans 55 Canneries

Soviet Russia plans to erect 55 food canning factories at a cost of nearly $35,000,000 before 1933, according to advices from British tin producers. Details have been announced in London by M. Shostak, director of Arcos, Ltd., who says that at first the tin plate required will be imported.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

ESTABLISHED 1855

The Non-Ferrous Metals

THE position of the principal commercial metals other than iron and steel at the present time is a subject of unusual interest. In respect to each of them chapters might usefully be written. We may not venture upon anything more than a summary of the outstanding features.

Copper experienced a remarkable curtailment of demand following the financial debacle of last November. It is incredible that final consumption should have become so much restricted. Rather is the explanation that the manufacturing and distributing system has been living on the supplies permeating it, which probably are normally more extensive than those of any other metal. This resort to invisible stocks caused the visible to pile up in the hands of producers and the latter naturally curtailed production to prevent their load from becoming excessively burdensome. Confident of the demand that is soon bound to ensue from the channels beyond them that are becoming thoroughly drained, and being free from any exigencies of distress selling, the producers have maintained their price of 18c.

Lead has been the most comfortable metal during the last four months of depression. Shipments by producers have shown but little recession from a year ago. Lead production and consumption are probably closer together than in the instance of copper, i.e., the metal goes through fewer hands and processes. The behavior of lead supports the opinion of the copper producers.

Zinc is the base metal that is economically in real distress. This is owing to the augmentation of supply of raw material by the flotation and Waelz processes, the overbuilding of metallurgical capacity during the World War and the further addition thereto in order to enjoy the advantage of the electrolytic process, and finally the nationalism of Europe that inspires further overbuilding. Not even may a cartel cope against such conditions, and the last effort of that kind exploded at the end of 1929. Since then the price for spelter at London has fallen to about £18, the lowest in more than 20 years, which is about 3.9c. The St. Louis price is about 5.1c.; the only thing that saves American producers is the tariff of 1.75c. per lb., but even 5.1c. is below our marginal cost of production. No one who requires spelter need fear to contract for it at existing levels. Conscious of this American producers are carrying their large stocks complacently.

Tin also has been over-produced, but the British who function principally in this metal have made up their minds that there is no sense in flooding an unwilling market and consequently they have been consolidating their position. The news dispatches of last week reported that the Dutch producers of Banka and Billiton have agreed with the British upon a plan of restriction of output. This practically effects a world-wide control, remembering that the Bolivian output is mainly beneficiated through British smelters.

Aluminum and nickel are examples of benevolent and intelligent monopoly. The Aluminum Company of America controls one and the International Nickel Co. the other insofar as American markets are concerned. They maintain stable and relatively low prices. If they so desired they could make high prices, but they do not for the simple reason that they want to sell as much of their products as they can. Such monopoly spells enlightenment rather than extortion, although some politicians may not know it.

Silver has fallen to the lowest price of record, being quoted at scarcely more than 40 cents an ounce. The Indian government has been liquidating its reserves and to assure its operations it imposed an import duty equivalent to 9 or 10c. an ounce, which naturally demoralized the market in London and New York. The decline in silver has produced chaos in Oriental finance and economics. Likewise in Mexican. It has been fatal to the few mines whose ore is valuable for silver alone, but the larger part of the world's silver is derived from copper and lead ores as a by-product and consequently output is not severely curtailed. The prospect for silver seems to have no grounds for optimism.

New Developments in Carbide Tools

CARBIDE tools have now been actively exploited in the American market for a little over a year. Yet in this brief time they have been given trial runs in machine shops working in mass production, probably without exception. Few indeed are the smaller jobbing shops whose proprietors have not heard of the new cutting tools and are not in a receptive mood. How different from the "grape-vine telegraph" methods by which information spread about the high speed tools, secretly used in one or two important plants 30 years ago! It is a praiseworthy achievement of vigorous exploitation and publicity.

Of course, the metal-working industry is nowadays more receptive to new ideas than it was a generation ago. Furthermore, the common machine tools are large and powerful enough to be run safely at those overloads necessary to test the superiority of a new cutting material. Such conditions in the shops of the prospective customers are conducive to a rapid ap-

praisal of any innovation in practice, and a few months will serve where years formerly were required.

This is fortunate, for the field and adaptability of the cemented tungsten carbide, as made by the process originally proposed by the German inventors, are barely outlined before improvements in manufacturing method are announced. Dr. S. L. Hoyt, in his recent Institute of Metals lecture, said that by pressing a mixture of three powders (tungsten, carbon and cobalt) and simultaneously heating by an electric current, tool bits could be produced practically free of voids and of superior hardness. We also hear that tools made by melting the ingredients and casting to form are ready for the market.

Obviously interesting times are ahead in the machine shops before the relative merits of these competing materials (and others conceivably to be developed) can be properly appraised.

As to the general utility of the hard metal carbides for cutting tools, the appraisal made some months ago by THE IRON AGE seems to be confirmed by passing events. We then expressed the opinion that the new tools would no more supersede the high speed analyses than the latter had superseded the earlier "fast-finishing" and plain carbon tools. In the truest sense they would be supplementary, in that each type would be utilized for the machining of materials not easily handled by any tool formerly known.

Thus the application of carbide tools to hard materials like glass, white iron and martensitic steel, to tough materials like aluminum bronzes and bakelite, to soft materials like cast aluminum alloys, to abrasive materials like clay and micalex, was immediately apparent and instantly welcomed by fabricators of these materials. General acceptance for cutting steel has been slower, despite the undoubted facts that carbide tools can be operated several times as fast and as long as the best high speed, other cutting conditions being equal. Nor can this hesitancy be ascribed to any gross weakness in the machine tool itself. It must be admitted that a lathe to take full advantage of these increased speeds would be a much more powerful, expensive machine than the ones ordinarily manufactured today, specially constructed to eliminate vibration at the nose of the tool. Nevertheless, as remarked before, there are plenty of machines now in the production line which can be safely speeded to a point far beyond the resistance of high-speed steel.

While cognizant of the success which has been achieved in several machine shops working irons and steels, we venture the prediction that the expected theoretical advantage of the high cutting speed will not accrue at once to much of the ordinary run of machining operations on annealed steels. In the first place, a large fraction is done with formed milling cutters or small taps—tools whose size and shape do not readily admit of manufacture in the hard carbides by the present methods, or subsequent dressing after use.

In the second place, there is a limit to the amount of tool pressure the work itself will stand—we have in mind an instance where rapid turning of steel shafting by stellite tools was abandoned because the rough turning "sprung" the work, and the necessary straightening and recentering cost more than the saving by higher speed cutting. Thirdly, the carbide tools themselves, while very, very hard, lack the toughness of properly hardened steel, and consequently are more likely to break down under the jolt of entering a new cut, an interrupted cut, or a vibrating chatter.

The future will show whether the great and almost instantaneous success the carbide tools have achieved on the jobs difficult or impossible to high speed steel, and the success on certain mass production operations on steel and iron, can be extended back into the metal cutting field generally. Improvement in practice undoubtedly will continue. Perhaps it will take the form of a tougher carbide tool. Perhaps it will be found that preliminary softening heat treatments now necessary on certain alloy steels can be omitted. Perhaps it will be found more economical at times to take a heavy, rapid cut than a light, slow one. At any rate, interesting times are ahead!

Is the Next Step Toward Differentiation?

THE machine promises to emancipate mankind from a deficiency economy, not only banishing the fear of hunger, but spreading creature comforts among the masses. It has demonstrated the importance profit-wise of manufacturing and distributing an ever-increasing quantity of goods. It has introduced an order in which the average man is no longer valued so much for the work he can do as for the commodities he can be induced to buy.

Yet the same forces that are cheapening goods are threatening the position of the consumer. Labor-saving equipment has brought the problem of technological unemployment. A more inclusive type of unemployment, reaching men of executive caliber, is a by-product of the many mergers that contribute their economies to making and marketing products.

Such dislocation of personnel is not new and it may be contended, not without historical justification, that the temporary individual distress it causes is more than compensated for by the eventual material gains of society as a whole.

But material welfare, important as it is, is not the sum total of all human satisfactions. All men, and Americans in particular, place a high value on personal independence. It is not to be forgotten that it was not material gain, but political, economic and religious freedom, that drew many thousands of our earlier immigrants to these shores. In the ruder pioneer days the frontier was steadily forced westward by men who sought opportunities for individual initiative and independent enterprise. Commenting on this dominant characteristic of the early American, Benjamin Franklin said of this country, "Labor will never be cheap here, where no man continues to labor long for others."

A people with such antecedents is unlikely to accept as final an economic trend which threatens to displace democratic civility with the servility, sycophancy and internal politics that tend to rear their heads in the rank and file of larger organizations or the hauteur and arrogance that sometimes crop out in high places. They can hardly be satisfied with a situation in which their jobs are insecure and age limits or the steadily diminishing field for independent enterprise cut down their chances for reemployment.

These human factors cannot be ignored in appraising the future of the machine age. Mass production and mass distribution are, after all, young, and present

tendencies may undergo material alteration in the course of time. That a definite modification of current trends is in prospect is the view of the *Commercial and Financial Chronicle*, which declares that there has been too much conformity in the life of the people and too much uniformity in manufacture to meet their wants and needs. Differentiation, it believes, will naturally follow dwarfing and confining concentration. In summing up, this journal says:

"Running hog-wild after certain theories of saving waste, uniformity, mass and machine, can never eliminate individuality in human nature."

Fuel and Water Power

TEN years ago there was responsible engineering opinion that in general water power could not compete with steam power in the United States. Cases in which it could compete would be exceptional, at points far removed from coal deposits and where water power was obtainable with particular ease. The records now show that the opinion has easily justified itself. It has had some adventitious aid, by the increasing cheapness of coal, which perhaps was not fully foreseen.

A report just issued shows that developed water power increased only 236,248 hp. during 1929, representing 1.7 per cent, the smallest increase in the records. That particular showing is not entirely fair, however, as about 800,000 hp. is scheduled for completion in 1930, but even that would be low relative to the past. The first report on developed water power was for November, 1921, showing 7,926,958 hp. then in existence. Assuming 8,000,000 hp. for Jan. 1, 1922, we have for comparison 11,176,596 hp. for Jan. 1, 1926, and 13,807,778 hp. for Jan. 1, 1930.

In the first four years the increase was 3,175,000 hp., or 40 per cent, while the next four years showed 2,631,182 hp. or only 24 per cent. Roughly speaking, the present water power is about one-fourth of the total steam, internal combustion and water power of the country. There is an assumption that in the last quarter century the total power has been increasing approximately in arithmetical, not geometric, progression, at something like 1,700,000 hp. per annum, which gives us a sketch of how water power development has compared.

The most precise statistics illustrating progressive fuel economy are the reports of coal consumption by public utilities. Per kilowatt-hour they consumed 3.2 pounds of coal in 1919, 1.76 pounds in 1928 and 1.69 pounds in 1929, cutting their consumption approximately in half in ten years. Total coal consumption was 35,100,000 net tons in 1919 and 44,925,000 net tons in 1929.

Should there be absolutely no further development in the art of getting power out of coal, the total economy of the country would nevertheless continue increasing for many years because the best practice of today is far from being in general use, and year by year there will be a spread of the most economical equipment and methods.

There are, of course, some improvements in methods of water power utilization but they cannot compare with progress in fuel utilization. The record of fuel economy is made the more impressive by the fact that in general the cost of coal has been going down for years. It is a pity that coal is altogether so cheap. It could bring enough money to afford reasonable profits to the best positioned producers and still be plenty cheap. Coal production varies so widely from year to year that it is impossible to make exact comparisons, but in a general way it may be said that there has been no increase in the last ten or fourteen years. Everyone knows that there has been a great increase in power produced by coal, and thus evidence is afforded of the general increase in economy in utilization, while at the same time an explanation is furnished of why coal is so cheap.

Must Chicago Show the Way?

RACKET, racketeers and other derivatives are new words that have not yet been defined in our lexicons, but no definitions are necessary for the present generation of Americans, inasmuch as everyone who is wideawake knows what they mean. The man on the street always knows such things earlier than the lexicographers.

Racketeering is no new thing, although the name for it may erstwhile have been otherwise. Nor is it confined to Chicago. The good people of that metropolis will concede, however, that in their city it has attained its apogee. Gordon L. Hotstetter, executive secretary of the Employers' Association of Chicago, estimates that the cost of the modern type of gypping is $100,000,000 a year to the people of Chicago and a billion to the country. Wherefore the mulcting of Chicago is obviously out of proportion.

Mr. Hotstetter thinks that the growing intrenchment of this class of economic parasites behind the bulwark of collusive arrangements involving unscrupulous labor leaders, self-seeking politicians and dishonest men in business is rapidly making this a very difficult crime to cure. We should say "has already made" rather than "is making."

There is a cure that is simple in principle. This is to make racketeering—banditry or whatever name may be chosen—so hazardous an undertaking that it is not worth anyone's while to go into it. This is what Diaz conceived when he paved the way for the industrialization of Mexico. He appreciated that no one would exploit silver mines if the bullion were going to be stolen by bandits on the way to the express office. So he exterminated the bandits. This was bloody, but it was salutary.

Mussolini has done a similar job in Italy without being so elemental. Perhaps he did not have to be. Anyhow, it is now possible to travel by railroad in Italy and retain possession of your baggage.

Likewise we remember the vigilantes in the days of '49 to '59 in our Eldorados. There is talk now of forming a vigilantes' organization in Chicago, to deal summarily with the gangsters who are defying the disorganized police, and to oust the grafting officials who are held responsible. It might also be suggested that Chicago be put under martial law for a year or two.

But how about the principles of self-government, the rule of the people, keeping things safe for democracy, having respect for the laws and all the rest of

The Week in Business

Drift of Current Financial and Economic Opinion

CURRENT seasonal declines in manufacturing activity are not ominous. The index of commodity prices has reached a new low that may be the bottom for the present downward swing of the business cycle. The cost of living accordingly will be lower in 1930 than in the past several years. There will be recovery in the spring. These are the fresh observations made on the business situation in financial and economic circles.

Expects Spring Recovery

It is the Harvard Economic Society which holds that conditions point to a spring business recovery. It stresses particularly the good volume of new security issues floated since the beginning of the year, issues "predominantly of the type which leads to construction or the improvement of plant and equipment."

Seasonal declines are regarded as not on the average any larger than is usual; also that seasonal increases are as large in general as normal. From one angle it is emphasized that weekly debits since the first of the year to individual accounts in banks outside of New York declined in 1927 and 1928 by approximately two billions of dollars, in 1929 by more than three-quarters of a billion, while in 1930 the decline has been only $133,000,000.

Prices at 1921 Level

The wholesale price level is practically down to the bottom of 1921. The National Industrial Conference Board recalls that the low point that year marked the end of the rapid decline from the peak reached in May, 1920. It suggests that "this may be nothing more than the precursor of the end of the storm."

Analyzing the cost of food, clothing, rents, fuel and light and house furnishing goods, the Alexander Hamilton Institute concludes that the cost of living will show a moderate reduction this year after fluctuating in a narrow range for seven years.

More Than a Recession

Department store stocks are reported low, but the distribution of commodities, based upon freight car loadings, is taken to indicate a good demand. It remains that Benjamin Baker, in the *Annalist*, believes "it is now pretty plain, and almost universally recognized, that the country is undergoing a depression," rather than a "recession, which is the harshest term some economic organizations have been willing to apply to the current downward movement of business."

such things that are talked about by orators and great commoners, etc.? Of course there is the primordial law of self-protection, which among other things includes safeguarding against being murdered, and this might be interpreted as a charter for vigilantes. This is no subject for levity, however. The majority of the people of Chicago are honest and hard-working, as are the majority of American citizens everywhere. The whole country is now watching to see how Chicago is going to deal with its problem.

CORRESPONDENCE

Limited Vogue of Metric System

To the Editor: In reply to the letter of Mr. Mossberg, in the Feb. 27 issue, on the subject of the cost of making the metric system compulsory in this country, it is difficult to convey an idea of the total cost of bringing about this revolution unless one uses terms which everybody understands. Such terms are costs to workmen for new tools, cost of new books in the schools, etc.

Secondly, it is impossible to enumerate all the items of cost, so that one finds it expedient to convey a picture of the gargantuan total cost by bunching together, as it were, hundreds of items of related costs into each one of the simple and general terms chosen.

Thirdly, it is not true that 90 per cent of the population of the world have adopted the metric system. It is more likely that 90 per cent of the population of the world could not say what the metric system is if they were asked. What is true is that probably 30 per cent of that part of the world's population who ever use weights and measures units use metric units. Perhaps 90 per cent of these never use more than one unit, or at the most two—one of weight and one of measure.

WILLIAM E. BULLOCK.
Secretary, American Institute of Weights and Measures.
New York.

Causes of Tool Steel Failures

To the Editor: My attention has been called to the article on "Tool Steel Failures" appearing in THE IRON AGE Feb. 20, page 583. There are a few corrections that I wish you would make in a subsequent issue.

In the second paragraph of this article it was stated that all tool steel was now being melted by the electric furnace process. This is true of well over 90 per cent of the steel being made, but there are a couple of mills in this country that are still using the crucible process for one or two special types of steel.

In the sixth paragraph it was stated that nitralloy steels are excellent for drawing dies, although at present these steels are not tough enough. My statement in regard to this was that, in our opinion, these steels do not have sufficient toughness for cutting tools and parts where resistance to shock is important.

A. H. D'ARCAMBAL,
Pratt & Whitney Co.
Hartford, Conn.

Studies on the physical chemistry of steel making have occupied the attention of the cooperative investigation sponsored by steel companies in the Pittsburgh region, Carnegie Institute of Technology and United States Bureau of Mines. Information on the principal findings has been printed at intervals by THE IRON AGE. The advisory board now publishes the result of two completed investigations in pamphlet form. Cooperative Bulletin No. 38 describes in detail the experiments on the deoxidation of basic open-hearth heats with silicon, and No. 46 with aluminum. The price is $2 and $1 respectively.

Sharp Gain in February Iron Output

Daily Rate Increased 10,181 Tons or 11 Per Cent— Net Gain of 7 Furnaces

WITH every active furnace heard from, there was a sharp increase in pig iron output in February over January. At 101,390 gross tons per day the increase was 10,181 tons or about 11 per cent. This compares with a slight decrease in January from December of ⅛ of one per cent.

Production of coke pig iron in February was 2,838,920 tons or 101,390 tons per day for the 28 days as compared with 2,827,464 tons or 91,209 tons per day for the 31 days in January. The next smallest February was 100,004 tons per day in 1928. A year ago the daily rate was 114,507 tons, a decrease for this year of 13,117 tons per day or about 11.5 per cent.

There was a net gain of seven furnaces in February—ten blown in and three shut down. This compares with a net gain of 15 furnaces in January (owing to an error the total furnaces blown in during January should have been 18 instead of 19).

Operating Rate on March 1

For the 179 furnaces active on March 1 the operating rate is estimated as 102,250 tons per day. This compares with 96,370 tons per day (revised) for the 172 furnaces active on Feb. 1.

Daily Average Production of Coke Pig Iron in the United States by Months Since Jan. 1, 1926—Gross Tons

	1926	1927	1928	1929	1930
Jan.	106,974	100,123	92,573	111,044	91,209
Feb.	104,408	105,024	100,004	114,507	101,390
Mar.	111,032	112,366	103,215	119,822	.....
Apr.	115,004	114,074	106,183	122,087	.....
May	112,304	109,385	105,931	125,745	.....
June	107,844	102,988	102,733	123,908	.....
½ year	109,660	107,351	101,763	119,564	.....
July	103,978	95,199	99,091	122,100	.....
Aug.	103,241	95,073	101,180	121,151	.....
Sept.	104,543	92,498	102,077	116,585	.....
Oct.	107,553	89,810	108,832	115,745	.....
Nov.	107,890	88,279	110,084	106,047	.....
Dec.	99,712	86,960	108,705	91,513	.....
Year	107,043	99,266	103,382	115,851	.....

Pig Iron Production by Districts, Gross Tons

	Feb. (28 days)	Jan. (31 days)	Dec. (31 days)	Nov. (30 days)
New York and Mass.	184,985	193,367	176,191	229,850
Lehigh Valley	82,465	85,835	77,314	73,856
Schuylkill Valley	64,708	68,439	68,512	73,321
Lower Susq. and Lebanon Valleys	36,524	30,320	37,428	35,332
Pittsburgh district	576,427	613,745	609,148	646,461
Shenango Valley	63,825	47,518	48,425	63,297
Western Pennsylvania	107,210	100,256	103,671	121,833
Maryland, Va. and Ky.	109,587	98,331	98,296	120,346
Wheeling district	106,896	113,867	131,594	105,272
Mahoning Valley	251,262	220,567	220,143	293,706
Central and North'n Ohio	264,110	268,861	254,161	338,978
Southern Ohio	44,502	49,679	44,702	49,462
Illinois and Indiana	613,915	583,161	589,465	644,039
Mich., Minn., Mo., Wis., Colo. and Utah	116,505	130,146	141,869	148,281
Alabama	215,999	220,781	229,857	228,021
Tennessee	.....	2,591	6,140	9,356
Total	2,838,920	2,827,464	2,836,916	3,181,411

Daily Rate of Pig Iron Production by Months—Gross Tons

	Steel Works Iron	Merchant Iron*	Total
February, 1929	89,246	25,261	114,507
March	95,461	24,361	119,822
April	95,680	26,407	122,087
May	100,174	25,571	125,745
June	99,993	23,915	123,908
July	98,044	24,056	122,100
August	98,900	22,251	121,151
September	95,426	21,159	116,585
October	93,644	22,101	115,745
November	83,276	22,771	106,047
December	68,152	23,361	91,513
January, 1930	71,447	19,762	91,209
February	81,850	19,810	101,390

*Includes pig iron made for the market by steel companies.

Coke Furnaces in Blast

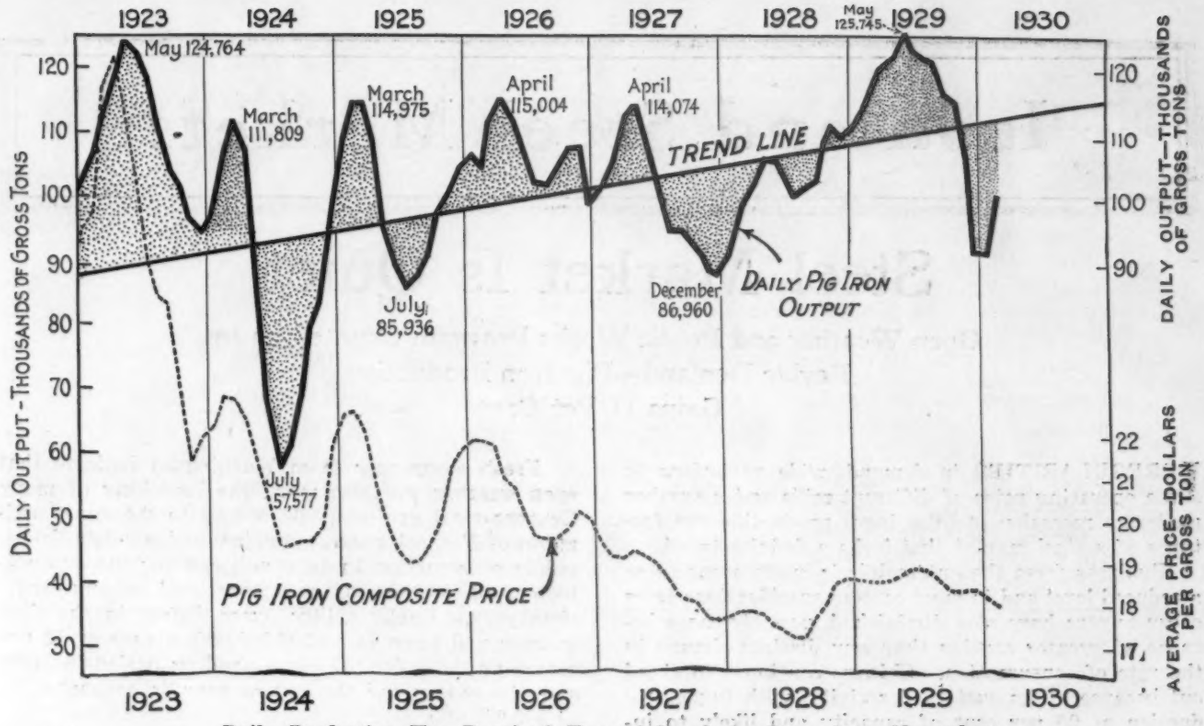
Furnaces	March 1 Number in Blast	March 1 Gross Tons per Day	Feb. 1 Number in Blast	Feb. 1 Gross Tons per Day
New York:				
Buffalo	11	5,580	10	5,200
Other New York	3	1,035	3	1,030
New Jersey	0	....	0	....
Pennsylvania:				
Lehigh Valley	6	2,950*	6	3,250*
Schuylkill Valley	4	2,030	5	2,370
Susquehanna Valley	2	1,305	2	980
Lebanon Valley	0	....	0	....
Ferromanganese	0	....	0	....
Pittsburgh District	31	20,410	30	19,460
Ferro. and Spiegel	3	490	3	500
Shenango Valley	4	2,280	4	2,080
Western Pennsylvania	6	3,600	6	2,945
Ferromanganese	2	225	2	290
Maryland	5	3,480	5	3,200
Wheeling District	6	3,815	6	3,675
Ohio:				
Mahoning Valley	15	9,220	14	8,325
Central and Northern	17	9,805	15	8,675
Southern	4	1,590	4	1,600
Illinois and Indiana	32	21,925	30	20,615
Mich., Wis. and Minn.	5	2,300	5	2,380
Colo., Mo. and Utah	4	1,860	4	1,820
The South:				
Virginia	1	220	1	240
Ferromanganese	0	....	1	95
Kentucky	1	380	0	....
Alabama	17	7,750	16	7,640
Tennessee	0	....	0	....
Total	179	102,250	172	96,370

*Includes spiegeleisen.

Production of Coke Pig Iron in United States by Months Beginning Jan. 1, 1928—Gross Tons

	1928	1929	1930
Jan.	2,869,761	3,442,370	2,827,464
Feb.	2,900,126	3,206,185	2,838,920
Mar.	3,199,674	3,714,473	.....
Apr.	3,185,504	3,662,625	.....
May	3,283,856	3,898,082	.....
June	3,082,000	3,717,225	.....
½ year	18,520,921	21,640,960	.....
July	3,071,824	3,785,120	.....
Aug.	3,136,570	3,755,680	.....
Sept.	3,062,314	3,497,564	.....
Oct.	3,373,806	3,588,118	.....
Nov.	3,302,523	3,181,411	.....
Dec.	3,369,846	2,836,916	.....
Year*	37,837,804	42,285,769	.....

*These totals do not include charcoal pig iron. The 1928 production of this iron was 142,960 gross tons.



Daily Production Has Regained Two-thirds of the Drop from November

Inclined line represents the gradually increasing theoretical needs of the country, ascertained by a balancing of the ups and downs in production. It shows an average yearly increase in consumption of about 1,275,000 tons

Of the ten furnaces blown in during February, three were Steel Corporation stacks, six belonged to independent steel companies with one credited to merchant producers. The three furnaces shut down were classified: One independent steel company and two merchant. Thus there was a net gain of eight steel-making stacks and a net loss of one merchant furnace.

Increase Mostly Steel-Making Iron

The expansion in output last month was mostly in steel-making iron. The increase over January was 10,133 tons per day or about 14 per cent. The February daily rate was 81,580 tons against 71,447 tons in January.

There was 21,310 tons of ferromanganese made in February, comparing with 27,260 tons in January. The February daily output was 761 tons against 879 tons in January. The February total was the smallest since 18,405 tons in April, 1928.

Furnaces In and Out

Among the furnaces blown in during February were: One Susquehanna furnace of the Hanna Furnace Co. in the Buffalo district; one Eliza furnace of the Jones & Laughlin Steel Corporation, and one Monongahela furnace of the National Tube Co. in the Pittsburgh district; one Ashland furnace of the American Rolling Mill Co. in Kentucky; one Haselton furnace of the Republic Iron & Steel Co. in the Mahoning Valley; one River furnace of the Corrigan-McKinney Co., and the Betty furnace of the Central Alloy Steel Corporation in northern Ohio; one South Chicago furnace of the Illinois Steel Co. and one Gary furnace in the Chicago district and one furnace of the Sloss-Sheffield Steel & Iron Co. in Alabama.

The three furnaces blown out or banked during February were the Keystone furnace in the Schuylkill Valley; one Aliquippa furnace of the Jones & Laughlin Steel Corporation in the Pittsburgh district; and the Oriskany furnace of E. J. Lavino & Co. in Virginia.

Production of Steel Companies for Own Use—Gross Tons

	Total Pig Iron Spiegel and Ferromanganese			Ferromanganese*		
	1928	1929	1930	1928	1929	1930
Jan.	2,155,133	2,651,416	2,214,875	22,298	28,208	27,260
Feb.	2,274,880	2,498,901	2,284,234	19,320	25,978	21,310
Mar.	2,588,158	2,959,295	.....	27,912	24,978	.....
Apr.	2,555,500	2,826,028	.....	18,405	22,413	.....
May	2,652,872	3,105,404	.....	29,940	25,896	.....
June	2,448,905	2,999,798	.....	32,088	33,363	.....
½ year	14,675,448	17,040,842	.....	149,963	160,836	.....
July	2,464,896	3,039,370	.....	32,909	31,040	.....
Aug.	2,561,904	3,065,874	.....	24,583	28,461	.....
Sept.	2,477,695	2,862,799	.....	22,278	27,505	.....
Oct.	2,729,589	2,902,960	.....	23,939	31,108	.....
Nov.	2,654,211	2,498,291	.....	29,773	31,866	.....
Dec.	2,647,863	2,112,704	.....	28,618	28,564	.....
Year	30,211,606	33,522,840	.....	312,063	339,380	.....

*Includes output of merchant furnaces.

International Agreement on Steel Denied

When questioned regarding the reported conclusion of a European-American understanding on all rolled steel products, leading producers in this country stated emphatically that no agreement had been reached and that, in fact, no negotiations to that end had even been started.

Crucible Steel Co. of America has acquired from R. K. LeBlond a tract of land in Cincinnati, on which a new warehouse is to be built. Construction work will be begun at once by the Ferro Construction Co.

Iron and Steel Markets

Steel Market Is Quiet

Open Weather and Public Works Program Counted on to Revive Demand—Pig Iron Production Gains 11 Per Cent

IRREGULARITIES in demand, wide variations in the operating rates of different mills and a further moderate recession in total ingot production are features of a steel market that lacks a definite trend.

Business from the automobile industry remains at a reduced level and in most centers specifications from other buyers have also diminished, possibly more because of greater caution than any distinct change in the rate of consumption. Chicago continues to stand out because of its sustained activity, with ingot production at 95 per cent of capacity and likely to increase rather than decline.

Steel makers with diversified output, and particularly those manufacturing rails and other heavy rolled products, are faring better than those specializing in lighter forms of steel. The Steel Corporation average remains at 85 per cent; on the other hand. the operations of certain producers of sheets and strip have fallen to 50 per cent of ingot capacity. The average for the entire industry is estimated at 78 per cent, compared with 80 per cent last week and 82 per cent two weeks ago.

Pig iron production in February was 2.838,920 tons, or 101,390 tons a day, compared with 2,827,464 tons, or 91,209 tons a day in January. The gain in daily average was 10,181 tons, or 11 per cent. The rate fell short of that for February a year ago—114,-507 tons—but exceeded that of February, 1928—100,-004 tons.

Larger output was accounted for by steel company furnaces. Nine steel works stacks were blown in and one was put out, as against one merchant furnace lighted and two blown out. The operating rate for 179 furnaces active on March 1 was 102.250 tons a day, compared with 96,370 tons for 172 stacks on Feb. 1.

Pig iron production in March will depend on the course of steel demand. Thus far one of the chief supports of the steel market has been the railroads. Rail mills at Chicago are now running at capacity, and the steel requirements of railroad car builders are heavy, but rail output is seasonal and it is a question whether equipment buying will continue at the rate of recent months. Barring a possible purchase of 5000 cars by the New York Central in April or May, not a great deal of new equipment business is in prospect. Meanwhile some of the railroads have curtailed repair work.

The recent reaction in business, following the sharp rebound in demand in January, has been disappointing, but the steel trade is confident that the present interlude will be followed by a revival in activity with the coming of spring.

Fresh assurances from Washington indicate that open weather will also mark the launching of many Governmental projects. According to the latest estimates of Federal, State, municipal and county officials, public construction in 1930 will call for the expenditure of $3,500,000,000, the largest total for any peacetime year. Public utility expenditures in the first quarter will aggregate $305,000,000, a gain of 12 per cent over those for the corresponding period in 1929, and the outlay for the entire year is estimated at $1,400,000,000.

Although the time when the full effects of these programs will be felt is drawing nearer, construction, as measured by structural steel awards, does not reflect any definite trend. Lettings, at 32,000 tons, compare with a weekly average so far this year of 34,000 tons and with 44,000 and 36,000 tons per week, respectively, for the corresponding periods of 1929 and 1928.

The rise in costs that has come with irregular operations has increased the determination of mills to stiffen their prices on finished products. There has been a noticeable decline in the frequency of concessions, although this may be due partly to the fact that current inquiries are mainly for small tonnages.

Mills apparently will attempt to obtain advances of $2 a ton over current prices on second quarter business in black, galvanized and metal furniture sheets. Quotations on blue annealed and automobile body sheets and hot and cold-rolled strip steel have been reaffirmed at recent levels, which are $2 a ton lower than those prevailing at the beginning of the year. Present prices on wire products have also been reestablished, but a leading maker of wire fencing has announced a revision of extras.

A large maker of wire rods has announced a second quarter price of $38, Pittsburgh, or $2 a gross ton below the ruling market at the beginning of the first quarter.

Scrap is generally easier, both because some producers have reduced their melt and because moderate weather has brought more old material into the market. Heavy melting steel advanced 25c. at Pittsburgh on a sale of 30,000 tons, although other grades are weaker. At Chicago heavy melting scrap declined 25c. a ton.

Pig iron buying is from hand to mouth except for "bargain" purchases induced by current low prices. Foundry iron has dropped 50c. a ton in eastern Pennsylvania and at Chicago.

THE IRON AGE composite price for pig iron is now $17.75 a gross ton, compared with $17.92 a week ago and $18.38 a year ago. Finished steel remains at 2.312c. a lb.

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Mar. 4, 1930	Feb. 25, 1930	Feb. 4, 1930	Mar. 5, 1929
No. 2 fdy., Philadelphia	*$20.26*	$20.76	$20.76	$21.26
No. 2, Valley furnace	18.50	18.50	18.50	17.50
No. 2 Southern, Cin'ti	16.69	16.69	17.69	20.19
No. 2, Birmingham	15.00	15.00	14.50	16.50
No. 2 foundry, Chicago*	*19.50*	20.00	20.00	20.00
Basic, del'd eastern Pa.	19.25	19.25	19.50	20.25
Basic, Valley furnace	18.50	18.50	18.50	17.50
Valley Bessemer, del'd P'gh	20.76	20.76	20.76	20.01
Malleable, Chicago*	*19.50*	20.00	20.00	20.00
Malleable, Valley	19.00	19.00	19.00	18.00
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	94.00	94.00	100.00	105.00

Rails, Billets, Etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	33.00	33.00	33.00	34.00
Sheet bars, Pittsburgh	33.00	33.00	33.00	35.00
Slabs, Pittsburgh	33.00	33.00	33.00	34.00
Forging billets, Pittsburgh	38.00	38.00	38.00	39.00
Wire rods, Pittsburgh	*38.00*	39.00	40.00	42.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.85	1.85	1.85	1.85

Finished Steel, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.85	1.85	1.85	1.90
Bars, Chicago	1.95	1.95	1.95	2.05
Bars, Cleveland	1.85	1.85	1.85	1.90
Bars, New York	2.19	2.19	2.19	2.24
Tank plates, Pittsburgh	1.80	1.80	1.80	1.90
Tank plates, Chicago	1.95	1.95	1.95	2.05
Tank plates, New York	2.07½	2.07½	2.07½	2.17½
Structural shapes, Pittsburgh	1.80	1.80	1.80	1.90
Structural shapes, Chicago	1.95	1.95	1.95	2.05
Structural shapes, New York	2.04½	2.04½	2.04½	2.14½
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	2.30
Hot-rolled strips, Pittsburgh	1.80	1.80	1.80	1.80
Cold-rolled strips, Pittsburgh	2.65	2.65	2.65	2.85

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Finished Steel, *Per Lb. to Large Buyers:*	Mar. 4, 1930 Cents	Feb. 25, 1930 Cents	Feb. 4, 1930 Cents	Mar. 5, 1929 Cents
Sheets, black, No. 24, P'gh	2.65	2.65	2.60	2.85
Sheets, black, No. 24, Chicago dist. mill	2.75	2.75	2.75	3.05
Sheets, galv., No. 24, P'gh	3.30	3.30	3.30	3.60
Sheets, galv., No. 24, Chicago dist. mill	3.40	3.40	3.40	3.80
Sheets, blue, No. 13, P'gh	2.25	2.25	2.25	2.20
Sheets, blue, No. 13, Chicago dist. mill	2.35	2.35	2.35	2.40
Wire nails, Pittsburgh	2.25	2.25	2.25	2.65
Wire nails, Chicago dist. mill	2.35	2.35	2.35	2.70
Plain wire, Pittsburgh	2.40	2.40	2.40	2.50
Plain wire, Chicago dist. mill	2.45	2.45	2.45	2.55
Barbed wire, galv., P'gh	2.95	2.95	2.95	3.30
Barbed wire, galv., Chicago dist. mill	3.00	3.00	3.00	3.35
Tin plate, 100 lb. box, P'gh	$5.25	$5.25	$5.25	$5.35

Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	$16.75	$16.50	$16.75	$18.50
Heavy melting steel, Phila	15.00	15.00	14.50	16.00
Heavy melting steel, Ch'go	*13.25*	13.50	13.00	15.50
Carwheels, Chicago	15.00	15.00	14.25	14.50
Carwheels, Philadelphia	15.00	15.00	15.00	16.50
No. 1 cast, Pittsburgh	14.50	14.50	14.50	15.00
No. 1 cast, Philadelphia	15.00	15.00	15.00	16.50
No. 1 cast, Ch'go (net ton)	*13.75*	14.00	13.50	16.00
No. 1 RR. wrot., Phila	15.00	15.00	15.00	16.00
No. 1 RR. wrot., Ch'go (net)	12.25	12.25	12.00	14.00

Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.60	$2.60	$2.60	$3.10
Foundry coke, prompt	3.50	3.50	3.50	3.75

Metals, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Lake copper, New York	18.12½	18.12½	18.12½	19.62½
Electrolytic copper, refinery	17.75	17.75	17.75	19.25
Tin (Straits), New York	*37.00*	38.12½	39.12½	48.75
Zinc, East St. Louis	*5.10*	5.15	5.25	6.35
Zinc, New York	*5.45*	5.50	5.60	6.70
Lead, St. Louis	*5.85*	6.10	6.10	7.05
Lead, New York	*6.00*	6.25	6.25	7.10
Antimony (Asiatic), N. Y.	9.00	9.00	8.75	9.12½

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Pittsburgh

Reduced Steel Specifications Bring Slight Declines in Ingot Output—Seasonal Gains Expected Soon

PITTSBURGH, March 4.—Further slight declines in steel ingot output in Pittsburgh and nearby districts have resulted from reduced specifications for flat-rolled and other steel products in the last two weeks. While the average ingot operating rate in the immediate district has probably not declined more than one or two points, open-hearth schedules in the Valleys have dropped to about 70 per cent, with the Wheeling district reflecting similar declines.

Heavy rail and structural output in the Pittsburgh district has maintained the rate here, and the larger companies with well diversified lines are holding their own. The other extreme is reflected by one of the smaller companies in the district which is running only three open-hearth furnaces this week as compared with 10 two or three weeks ago.

The decline in steel orders is generally ascribed to the curtailment of specifications by the automobile industry, although a more thorough solution is offered by the fact that steel consumers in general are still placing their requirements very cautiously, and have failed to expand their purchases in the manner usually expected in late February and March.

As a result, prospects of heavier releases this month are not particularly bright, although steel makers feel certain that the coming of warmer weather will expand business in many lines which are now dormant.

Early reflections of spring activity in the building industry are seen in increased inquiries for reinforcing bars and in slightly improved demand for structural steel. Large structural projects are still exceptional in this district, although 8000 to 10,000 tons of shapes will be required for the Gulf Oil Building in Pittsburgh, on which early action is expected. Activity in sheet steel products required by the building industry is not yet marked, although some metal lath tonnage is reaching mills.

Line pipe projects are becoming more clearly defined, and local makers are now assured that at least one of the lines planned to carry gas from the Texas fields to Chicago will be placed in the next month or two by the Doherty interests. This line will call for 800 to 900 miles of 24-in. pipe, probably as much as 200,000 tons. A second line between the same points may be built next year.

Steel prices have changed very little, but additional strength is reported on some products. One producer of wire rods has opened books for second quarter at $38, Pittsburgh or Cleveland, a decline of $2 a ton from the recently quoted levels. No other open declines are reported. Makers of black and galvanized sheets will make strenuous efforts to establish the $2 a ton advance for second quarter which was announced last week. Bars, shapes and plates are quotable in this district at 1.85c., Pittsburgh, although shading on plates and shapes has not disappeared in competitive territories.

The feature of the scrap market during the past week was the purchase of a large tonnage of No. 1

heavy melting steel by a large Pittsburgh district consumer at $16.75 and $17. The amount involved was said to have been about 30,000 tons, and the top price paid represents an advance of 25c. a ton over recent market quotations. The pig iron market is unchanged, with very little activity.

Pig Iron. — Shipments of foundry iron have held up well in the last week or two, although there has been no further improvement. On the other hand, consumption of basic iron has been sharply curtailed at one or two points. Sales are still confined to small lots of immediate shipment, and there is practically no inquiry of importance before the trade.

The continued low activity of radiator and sanitary ware foundries in the district is offset to a certain extent by heavier operations on the part of steel foundries and heavy machinery makers. Foundry operations, as a whole, are at least 25 per cent under the average on the same date last year, and no marked increases are in prospect.

Prices are nominal in a listless market, with foundry and basic iron still quoted at $18.50, Valley, and Bessemer and malleable at $19. Variations from these figures are rare, except in the case of competition from other districts.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$18.50
Bessemer	19.00
Gray forge	18.00
No. 2 foundry	18.50
No. 3 foundry	18.00
Malleable	19.00
Low phos., copper free	27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$19.00
No. 2 foundry	19.00
No. 3 foundry	18.50
Malleable	19.50

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

Ferroalloys. — Shipments of ferromanganese in February increased slightly over those of the previous month, but were considerably less than in the corresponding period of 1929. Following the recent reduction of $1 to $6 a ton, prices are well stabilized. Occasional sales of spiegeleisen are bringing $34, Hazard, Pa., this being the price to small consumers. Otherwise the market is quiet, with shipments steady.

Semi-Finished Steel.—Shipments of crude steel to non-integrated companies have fallen off slightly in the last week or two, although they are still large enough to indicate a 75 per cent operating rate on the part of the smaller mills. Demand for sheet bars from tin plate makers is gradually improving, and forging shops are taking a fair tonnage of billets. Spot sales are infrequent, but invariably call for immediate shipment. Some of the larger companies, which had begun to accumulate more than ample reserves of crude steel, have now reduced production slightly in order to keep it in line with current demand.

Prices on billets, slabs and sheet bars are still quoted nominally at $33, Pittsburgh or Youngstown, a quotation which is being adhered to on occasional small-lot sales. No intimation has yet been made as to what the second quarter price will be, although it seems certain that no advance is contemplated. One large maker of wire rods has announced that its second quarter price will be $38 a ton, and other companies will, of course, follow this reduction, which is a decline of $2 a ton from the recent market. A number of users had already been getting this price.

Bars, Shapes and Plates.—Business in the heavy hot-rolled products has scarcely reflected the slight reaction which had been noticed among other steel products in the last week or two. Although specifications for bars have fallen off slightly with some companies, tonnage releases on plates and shapes are keeping up at about the rate which they have averaged in the last two months. Plate specifications from the railroad car builders still leave something to be desired, but are constantly improving. Some companies also report a slight improvement in requirements for tankage steel, although oil country demand is very poor. The barge business has also failed to develop to any marked extent in spite of the fact that prospects for this work during the year are generally considered good.

Structural awards in this district are few and far between, although the Gulf Oil Building in Pittsburgh, which will require 8000 to 10,000 tons, is expected to be let soon. The larger fabricating shops in the district are well engaged, and shape mills are running above the average for finished steel products in general. Demand for bars is beginning to get considerable support from the reinforcing steel industry, and bridges and highway improvements in the immediate Pittsburgh area will take several thousand tons in the near future.

Prices have not changed materially, but the tendency toward strength reported recently continues. Bars are holding at 1.85c., and in the Pittsburgh district the same figure applies on most of the plate and shape tonnages now being placed. Nevertheless, weakness persists in other districts.

Rails and Track Supplies.—Specifications for track accessories in February were up to the corresponding month last year with most companies, and the new month is starting off well. New buying is not important at this time, although one or two roads have placed supplementary orders for both rails and accessories. Demand for light rails is quiet, and the price is subject to shading in order to meet the competition of makers of rerolled rails.

Tubular Goods.—Even though prospective pipe business still looks good, mills can find little to enjoy in the present demand, which many companies report as being in less volume than was the case in January. Operations of the lapweld and buttweld mills do not average more than 40 per cent of theoretical capacity, and seamless units are by no means busy. Actual inquiries for line pipe are still lacking, although the application of the Sun Oil Co. for permission to build a pipe line across Pennsylvania will be decided upon by the State authorities on March 5, and early action on this business is likely if the permit is granted. Demand for mechanical tubing is only fair, while boiler tubes are rather active.

The Iron Age Composite Prices

Finished Steel

March 4, 1930, 2.312c. a Lb.

One week ago	2.312c.
One month ago	2.305c.
One year ago	2.391c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High	Low
1930	2.362c., Jan. 7;	2.305c., Jan. 28
1929	2.412c., April 2;	2.362c., Oct. 29
1928	2.391c., Dec. 11;	2.314c., Jan. 3
1927	2.453c., Jan. 4;	2.293c., Oct. 25
1926	2.453c., Jan. 5;	2.403c., May 18
1925	2.560c., Jan. 6;	2.396c., Aug. 18

Pig Iron

March 4, 1930, $17.75 a Gross Ton

One week ago	$17.92
One month ago	18.17
One year ago	18.38

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High	Low
1930	$18.21, Jan. 7;	$17.75, Mar. 4
1929	18.71, May 14;	18.21, Dec. 17
1928	18.59, Nov. 27;	17.04, July 24
1927	19.71, Jan. 4;	17.54, Nov. 1
1926	21.54, Jan. 5;	19.46, July 13
1925	22.50, Jan. 13;	18.96, July 7

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.85c.
F.o.b. Chicago	1.95c. to 2.00c.
Del'd Philadelphia	2.17c. to 2.22c.
Del'd New York	2.19c. to 2.24c.
Del'd Cleveland	1.85c.
F.o.b. Cleveland	1.85c.
F.o.b. Lackawanna	2.00c.
F.o.b. Birmingham	2.00c.
C.i.f. Pacific ports	2.35c.
F.o.b. San Francisco mills	2.35c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills, 40, 50, 60-ft.	1.95c.
F.o.b. Pittsburgh mills, cut lengths	2.20c.
F.o.b. Birmingham, mill lengths	2.00c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.80c. to 1.90c.
F.o.b. Chicago Heights mill	1.85c.
Del'd Philadelphia	2.12c. to 2.22c.

Iron

Common iron, f.o.b. Chicago	1.95c. to 2.00c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.12c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.80c. to 1.85c.
F.o.b. Chicago	1.95c. to 2.00c.
F.o.b. Birmingham	2.00c.
Del'd Cleveland	1.99c. to 2.04c.
Del'd Philadelphia	2.00c. to 2.05c.
F.o.b. Coatesville	1.90c. to 1.95c.
F.o.b. Sparrows Point	1.90c. to 1.95c.
F.o.b. Lackawanna	1.90c. to 1.95c.
Del'd New York	2.07½c. to 2.12½c.
C.i.f. Pacific ports	2.25c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.80c. to 1.85c.
F.o.b. Chicago	1.95c. to 2.00c.
F.o.b. Birmingham	2.00c.
F.o.b. Lackawanna	1 90c. to 1.95c.
F.o.b. Bethlehem	1.90c. to 1.95c.
Del'd Cleveland	2.04c.
Del'd Philadelphia	1.86c. to 2.01c.
Del'd New York	2.04½c. to 2.09½c.
C.i.f. Pacific Ports	2.35c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	1.90c.
Wider than 6 in., P'gh	1.80c.
6 in. and narrower, Chicago	2.10c.
Wider than 6 in., Chicago	2.00c.
Cooperage stock, P'gh	2.20c.
Cooperage stock, Chicago	2.30c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.10c.
Bars, f.o.b. Chicago	2.10c.
Bars, Cleveland	2.10c.
Bars, Buffalo	2.10c.
Shafting, ground, f.o.b. mill	*2.45c. to 3.40c.
Strips, P'gh	2.65c. to 2.75c.
Strips, Cleveland	2.65c. to 2.75c.
Strips, del'd Chicago	2.95c.
Strips, Worcester	2.80c. to 2.90c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	4.00c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Merchant Trade

	Base per Keg
Standard wire nails	$2.25 to $2.30
Cement coated nails	2.30
Galvanized nails	4.30
	Base per Lb.
Polished staples	2.75c.
Galvanized staples	3.00c.
Barbed wire, galvanized	2.95c.
Annealed fence wire	2.45c.
Galvanized wire, No. 9	2.90c.
Woven wire fence (per net ton to retailers)	$65.00

To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage	2.40c.
Spring wire	3.50c.

(Carload lots, f.o.b. Chicago)

Wire nails	$2.35 to $2.45 (keg)
Annealed fence wire	2.50c. to 2.60c. (lb.)
Bright hard wire to manufacturing trade	2.45c.

Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

Cut Nails

	Per 100 Lb.
Carloads, Wheeling, Reading or Northumberland, Pa.	$2.55 to $2.60
Less carloads, Wheeling or Reading	2.70

Light Plates

No. 10, blue annealed, f.o.b. P'gh	2.10c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.20c.
No. 10, blue annealed, del'd Phila.	2.42c.
No. 10, blue annealed, B'ham	2.25c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh	2.25c.
No. 13, f.o.b. Chicago dist.	2.35c.
No. 13, del'd Philadelphia	2.57c.
No. 13, blue annealed, B'ham	2.50c.

Continuous Mill Sheets

No. 10 gage, f.o.b. P'gh	1.90c. to 2.00c.
No. 13 gage, f.o.b. P'gh	2.00c. to 2.15c.

(Usual range 24 in. to 48 in. wide)

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.65c.
No. 24, f.o.b. Chicago dist. mill	2.75c. to 2.85c.
No. 24, del'd Philadelphia	2.97c.
No. 24, f.o.b. Birmingham	2.90c.

Metal Furniture Sheets

No. 24, f.o.b. P'gh	3.90 c. to 4.00c.

Galvanized

No. 24, f.o.b. Pittsburgh	3.30c. to 3.40c.
No. 24, f.o.b. Chicago dist. mill	3.40c. to 3.50c.
No. 24, del'd Cleveland	3.49c. to 3.59c.
No. 24, del'd Philadelphia	3.62c. to 3.72c.
No. 24, f.o.b. Birmingham	3.45c. to 3.50c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.90c. to 3.00c.
No. 28, f.o.b. Chicago dist. mill	3.00c. to 3.10c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	3.90c.

Long Ternes

No 24, 8-lb. coating, f.o.b. mill	3.90c. to 4.00c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.90c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.25
Standard cokes, f.o.b. Gary	5.35

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)
(Per Package, 20 x 28 in.)

8-lb. coating I.C. $10.70	25-lb. coating I.C. $15.90
15-lb. coating I.C. 13.40	30-lb. coating I.C. 16.80
20-lb. coating I.C. 14.60	40-lb. coating I.C. 18.80

Alloy Steel Bars

(F.o.b. makers' mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(½% Nickel)	$0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molydenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.30 to 1.10 (Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bars	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	36.00
Light (from rail steel), f.o.b. mill	34.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅜ in. and larger	$2.80
Spikes, ½ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plate, steel	2.07½
Angle bars	$2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	*Iron* Inches	Black	Galv.
⅛	45	19½	¼ and ⅜	+11	+36
¼ to ⅜	51	25½	½	23	5
½	56	42½	¾	28	11
¾	60	48½	1 and 1¼	31	15
1 to 3	62	50½	1½ and 2	35	18

Lap Weld

2	55	43½	2	23	9
2½ to 6	59	47½	2½ to 3½	28	13
7 and 8	56	43½	4 to 6	30	17
9 and 10	54	42½	7 and 8	29	16
11 and 12	53	40½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	41	24½	2 to 3	61	50½
¼ to ⅜	47	30½	¼ and ⅜	+13	+48
½	53	42½	½	23	7
¾	58	47½	¾	28	12
1 to 1½	60	49½	1 to 2	34	18

Lap Weld, extra strong, plain ends

2	53	42½	½	39	13
2½ to 4	57	46½	2½ to 4	34	20
4½ to 6	56	45½	4½ to 6	33	19
7 to 8	52	39½	7 and 8	31	17
9 and 10	45	32½	9 to 12	21	8
11 and 12	44	31½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		*Charcoal Iron*	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3¼ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30%, base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

Wire Products.—Makers of merchant wire products are still attempting to bring some stability to the price situation, and one producer has announced second quarter prices of $2.30 to $2.40 a keg on nails. Recently large jobbers had been able to buy nails at $2.25, while the trade in general had been getting $2.30. Other merchant products will likewise be affected. Manufacturers' wire is holding at 2.40c., Pittsburgh, and spring wire at 3.50c. Demand for both products is fairly good, particularly for spring wire.

The leading maker of wire fencing has introduced a complete revision of price quotations covering its products. The base price to retailers is unchanged at $65 a net ton, although extras have been substantially reduced in many cases. The leading independents are expected to follow these changes in the near future.

Sheets.—Specifications for sheets continue to be disappointing. Makers who expected a rather marked improvement before the beginning of the present month are now faced with curtailed demand in some quarters, especially in the automobile industry. Although March production schedules of some makers of motor cars are slightly higher than they were in February, the increases are by no means general, and the leading maker of cars in the low-priced field plans no increase in output before the middle of the month.

Other consuming lines are taking sheets at only a fair rate, although tonnage figures are holding rather steadily at the reduced levels. Radio and stove manufacturers have little business, although demand from the electrical sundries and metal furniture industries is considered good. Improved seasonal demand for building materials which has been expected for the last two weeks has failed to develop in any volume, although some orders for metal lath are beginning to reach the mills.

The price situation has not been helped by the present stagnation in demand. Prices remain unchanged, but shading continues, and mills frankly admit that the $2 a ton advance, which had been announced for second quarter for black and galvanized sheets, will not be easy to establish.

Automobile manufacturers are still blamed for most of the price weakness, and are said to be pressing harder than ever for concessions because of the increased production costs incident to low output.

Sheet mill operations in the Pittsburgh and nearby districts have fallen under 70 per cent of capacity, and may drop to 65 before the end of the week.

Tin Plate.—Specifications continue to improve gradually, but makers have made little change in their operating schedules in the last week or two. The leading interest is operating its mills at slightly above 75 per cent of capacity, and some of the larger independents are maintaining a somewhat higher rate. Prospects for the canning crops cannot yet be estimated, although occasional reports from the farm districts indicate that increased acreage may be expected for some of the more common vegetables.

Strip Steel.—Specifications during the last week of February fell considerably below the average for the remainder of the month, but aggregate tonnage shipped by most mills averaged 5 to 10 per cent heavier than January. With demand from the automobile industry more restricted than it has been, heavy tonnage business is not plentiful and small orders are again forcing the mills to adopt interrupted production schedules. Hot strip mill operations are not above 50 per cent this week, while cold rolling units are doing little better than half as well.

Prices for hot-rolled material are holding at 1.80c., Pittsburgh, for strip wider than 6-in., and 1.90c. for the narrower sizes. On cold-rolled strip, variations from the 2.65c. price seem to be somewhat more common, although such concessions have been given only to tubing manufacturers and other very large users.

Cold-Finished Steel Bars.—The market is still dull, although specifications are coming in rather steadily at about the rate which has prevailed since the first of the year. Automobile makers are buying only in small lots for immediate shipment. Manufacturers of farm implements continue to be one of the best outlets for makers of cold-finished steel. The price is holding very well at 2.10c., Pittsburgh.

Coke.—The coke market is quiet, with few developments of interest. The furnace grade is still quotable at $2.60 a net ton, Connellsville, and the price is being adhered to in most of the current transactions. Heating coke is again slightly more active, although demand for the remainder of the season will be confined to small lot purchases to fill unexpected needs. Shipments of foundry coke are fairly steady, but not in large volume. Prices are somewhat better established.

Old Material.—Sale of a large amount, probably as much as 30,000 tons of No. 1 heavy melting steel to a Pittsburgh district consuming point was the feature of the scrap market last week. The greater part of the tonnage apparently brought $16.75 and $17, even though a $16.50 price may have figured in the sale.

Dealers are paying as low as $16 to cover at some points, although railroad steel or its equivalent is still scarce and commands a much better price at most consuming points. The market this week is quotable at $16.50 to $17, an advance of 25c. a ton.

Declining open-hearth operations at a number of the smaller plants in this area have cut down their scrap requirements, and rejections are still very common at some points.

The other grades of scrap are weaker, hydraulic compressed sheets having been sold in fair tonnage at $16.25. One mill is said to have bought for a few cents less. Specialties are still fairly strong, with dealers paying $20.50 and $21 to cover urgent contracts. Other grades of scrap are not quotably changed.

Considerable interest is attached this month to the sales of the railroad lists. The Baltimore & Ohio list, which closes on March 10, contains 9400 tons, while the Pennsylvania list, closing March 12, contains 47,700 tons.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$16.50 to $17.00
No. 2 heavy melting steel	14.50 to 15.00
Scrap rails	15.50 to 16.00
Compressed sheet steel	16.00 to 16.25
Bundled sheets, sides and ends	14.00 to 14.50
Cast iron carwheels	14.50 to 15.00
Sheet bar crops, ordinary	18.00 to 18.50
Heavy breakable cast	12.00 to 12.50
No. 2 railroad wrought	16.50 to 17.00
Hvy. steel axle turnings	14.00 to 14.50
Machine shop turnings	11.00 to 11.50
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	20.50 to 21.50
Railr. coil and leaf springs	20.50 to 21.50
Rolled steel wheels	20.50 to 21.50
Low phos. billet and bloom ends	21.50 to 22.50
Low phos. mill plates	20.00 to 21.00
Low phos. light grades	20.00 to 21.00
Low phos. sheet bar crops	21.00 to 22.00
Heavy steel axle turnings	14.00 to 14.50
Electric Furnace Grades:	
Low phos. punchings	18.50 to 19.50
Hvy. steel axle turnings	14.00 to 14.50
Blast Furnace Grades:	
Short shoveling steel turnings	11.50 to 12.00
Short mixed borings and turnings	11.00 to 11.50
Cast iron borings	11.00 to 11.50
Rolling Mill Grades:	
Steel car axles	20.50 to 21.50
Cupola Grades:	
No. 1 cast	14.00 to 15.00
Rails 3 ft. and under	18.50 to 19.50

Warehouse Prices, f.o.b. Pittsburgh

	Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.80c. to 2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.25c.
Hoops	4.25c.
Black sheets (No. 24), 25 or more bundles	3.60c.
Galv. sheets (No. 24), 25 or more bundles	4.25c.
Light plates, blue annealed (No. 10), 1 to 24 plates	3.25c.
Blue annealed sheets (No. 13), 1 to 24 sheets	3.40c.
Galv. corrug. sheets (No. 28), per square	4.13c.
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	60 per cent off list
Machine bolts, 100 count,	60 per cent off list
Carriage bolts, 100 count,	60 per cent off list
Nuts, all styles, 100 count,	60 per cent off list
Large rivets, base per 100 lb.	$3.50
Wire, black, soft ann'l'd, base per 100 lb	$2.75 to 2.85
Wire, galv. soft, base per 100 lb.	3.20 to 3.30
Common wire nails, per keg.	2.60 to 2.75
Cement coated nails, per keg	2.65 to 2.80

Manning, Maxwell & Moore, Inc., has opened a Milwaukee office at 492 Fourth Street. W. L. Stickler, formerly of the Milwaukee office of the E. L. Essley Machinery Co., is in charge.

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in. Pittsburgh	$33.00
Rerolling, 4-in. and under 10-in., Youngstown	33.00
Rerolling, 4-in. and under 10-in., Cleveland	33.00
Rerolling, 4-in. and under 10-in., Chicago.	34.00
Forging quality, Pittsburgh	38.00

Sheet Bars

(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$33.00
Youngstown	33.00
Cleveland	33.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$33.00
Youngstown	33.00
Cleveland	33.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.85c. to 1.90c.
Universal	1.85c. to 1.90c.
Sheared	1.85c. to 1.90c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$38.00 to $40.00
Cleveland	38.00 to 40.00
Chicago	39.00 to 41.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Adgerian	12.00c.
Iron ore, low phos., Swedish, average 68% iron	12.00c.
Iron ore, basic Swedish, average 65% iron	10.00c.
Manganese ore, washed, 52% manganese, from the Caucasus	30.00c.
Manganese ore, Brazilian, African or Indian, basic 50%	30.00c.
Tungsten ore, high grade, per unit, in 60% concentrates	$15.00 to $16.00

	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantc seaboard	$22.00 to $24.00

	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.60
Foundry, f.o.b. Connellsville prompt	$3.50 to 4.75
Foundry, by-product, Ch'go ovens	8.00
Foundry, by-product, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, ¾-in. f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	80c. to 90c.
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.10

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$94.00 to $99.00
Foreign, 80%, Atlantic or Gulf port, duty paid	94.00 to 99.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$31.00 to $34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

	Per Gross Ton Furnace		Per Gross Ton Furnace
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	45.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
10%	$30.00	12%	$34.00
11%	32.00		

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
6%	$22.00 to $23.00	10%	$26.00 to $28.00
7%	23.00 to 24.00	11%	28.00 to 30.00
8%	24.00 to 25.00	12%	30.00 to 32.00
9%	25.00 to 26.00		

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd	$1.40 to $1.50
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$18.25 to 18.75
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

Per 1000 f.o.b. Works

	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

Per 1000 f.o.b. Works

Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	70
†Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅛ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages, P'gh	75, 20, 10 and 5
Stove bolts in packages, Chicago	75, 20, 10 and 5
Stove bolts in packages, Cleveland	75, 20, 10 and 5
Stove bolts in bulk, P'gh	75, 20, 10, 5 and 2½
Stove bolts in bulk, Chicago	75, 20, 10, 5 and 2½
Stove bolts in bulk, Cleveland	75, 20, 10, 5 and 2½
Tire bolts	60, 5 and 5

Discounts of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55, 60 per cent apply.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$3.10
F.o.b. Chicago	3.20

Small Rivets

(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago	70 and 10

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10 and 5
Milled standard set screws, case hardened,	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread,	85 and 10
Upset hex. cap screws, S.A.E. thread	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

Chicago

Specifications Continue to Support Steel Ingot Rate of 95 Per Cent—Pig Iron Reduced 50c.

CHICAGO, March 4.—Specifications for finished steel products, including standard-section rails, continue in large volume. Ingot output still holds at close to 95 per cent of capacity, and there is nothing in either releases or new buying to indicate an early change to a lower level. In fact, there is a possibility, should general business be sustained, that releases for plate tonnage for the gas line to Chicago will force employment of added ingot capacity.

Price structures show variation, depending on the product. Northern foundry iron is off 50c. a ton at Chicago, and Southern iron is freely offered in this market at $13 a ton, Birmingham. Quotations on plates, shapes and bars, for the first time in many weeks, are showing strength at 1.95c. to 2c. a lb.

Prices for wire products are still somewhat irregular, but there is indication that the spring trade is awakening and, with a more active market, prices may tend to crystallize more firmly at present levels. There is still much talk, but no definite action, in the matter of raising prices of sheets $2 a ton. Delay in this matter is checking the opening of second quarter books. No official announcements have been forthcoming as to price policies on heavy tonnage products that are to be delivered in the new period.

Deliveries on some sizes of plates, shapes and bars are already such that, if present obligations are adhered to, steel bought at present prices will be billed in April and in some cases in May. On this score, the thought is expressed in some quarters that there will be no change in price policies when users seek second quarter tonnages of these commodities.

Pig iron sellers are opening books for the coming quarter with the announcement of a cut in price. The scrap market is weak, with prices generally lower.

Effects of fluctuations in wheat prices are being closely watched by farm implement manufacturers, who are holding to a high rate of output.

Reports are reaching Chicago that automobile parts manufacturers are starting heavier schedules. A change of this kind is usually a forerunner of heavier automobile building.

Pig Iron.—Northern foundry iron has been marked down 50c. a ton to $19.50. In view of the size of melt and sustained heavy shipments, the change in price cannot be taken as a reflection of weakness in the market structure. It appears to be a move to bring prices paid for pig iron by local melters more in line with the prices paid by their competitors in other centers.

For some time competition among foundries has been unusually keen. The revision downward in local pig iron prices will undoubtedly help Chicago and nearby melters in meeting competition from other centers, but it may also give buyers of castings another argument for lower prices.

A number of large users have entered second quarter contracts at the new prices, but small melters continue to take iron on a hand-to-mouth basis. The tonnage still remaining on first quarter books and the general tendency of the market seem now to forecast larger shipments in March than were made in February.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$19.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	20.00
Malleable, not over 2.25 sil.	19.50
High phosphorus	19.50
Lake Super. charcoal, sil. 1.50	27.04
S'th'n No. 2 fdy. (all rail)	19.01
Low phos., sil. 1 to 2, copper free	29.50
Silvery, sil. 8 per cent	$28.79 to 29.79
Bess. ferrosilicon, 14-15 per cent	46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Ferroalloys.—Specifications for these commodities remain heavy from steel mills and steel foundries. New business in ferromanganese is quiet. Tests of the new price scale have been made only on small lots.

Plates.—Two orders for plates for oil storage tanks total 3000 tons, and fresh inquiries are for a like amount, with the result that open business now before the trade still stands at not less than 35,000 tons.

Shipments to the Milwaukee pipe manufacturer are larger, and it is thought by some that about March 15 releases will be issued against the tonnage needed for the line pipe that will bring natural gas to Chicago. When this contract was placed last fall, the steel requirements were estimated at somewhat over 100,000 tons. Since then the size of the line has been increased from 22 in. to 26 in. in diameter, and if two of the larger size lines should be laid, as now seems probable, the total steel needed would be not far from 250,000 tons.

Western car shops remain busy, with several months' work ahead of them. They continue to enter liberal specifications. About 1500 tons will be needed for 200 tank cars inquired for by an oil refiner. No definite inquiry has been issued for refrigerator cars by the Pacific Fruit Express. However, it is believed here that these cars are on an assured program.

The Chicago plate market is in a satisfactory position, especially so in view of the pipe tonnage that is in the balance. Deliveries average three weeks and upward on many of the common sizes. Occasionally shipments are possible in two weeks when tonnages can be added to current rolling schedules.

Prices are firmer at 1.95c. to 2c. a lb., Chicago. Competition from other producing centers has been less pressing in the last few days.

Structural Material. — Structural awards have experienced a sharp upturn this week. New contracts call for about 12,000 tons and fresh inquiries for more than 6000 tons. This situation is highly encouraging to fabricators, though, with shop operations at a low point, tonnage is not coming out in sufficient volume to make for economical operations and stronger prices.

This market stands much as it did a week ago in respect to the distribution of going tonnages. Awards in outlying districts are not far from what might be considered normal for this time of the year. In Chicago, however, money for building is still tight and there are some who foresee little change in this phase until early fall.

Foremost among new contracts is 6800 tons for grade separation work at Fifteenth Street, Chicago. New tonnages about to come into this market are 4000 tons for the Northwestern Mutual Life Building at Milwaukee and an unstated tonnage for a bascule bridge for the Pere Marquette.

Mill deliveries range from two to five weeks. Prices, which have shown some variation in recent weeks, give signs of being steadier at 1.95c. to 2c. a lb., Chicago.

Bars.—Demand for mild steel bars is steady and mills have well arranged schedules. Backlogs, though lighter than a year ago, are of fair size and are being maintained by new purchases. The difference in bar demand between the present and a year ago appears to be largely the result of lighter use by manufacturers of automobiles.

Current orders come from a wide variety of users. Sizable quantities are going to car shops, and there is no slackening in demand by manufacturers of farm machinery, who have not as yet been materially affected by the recent slump in wheat prices. Prices for mild steel bars are steady at 1.95c. to 2c., Chicago.

Reports from automobile manufacturing centers vary widely. However, it is well established that parts makers are swinging into heavier output, with March production schedules well above those of the past month.

Demand for alloy steel bars is steady and prices are unchanged. Iron bars are being used in moderate tonnage.

Miscellaneous users of rail steel bars are entering the market more freely. The result is that both new buying and specifications against old obligations are measurably larger. Bed manufacturers are finding business more brisk, and heavier tonnages will soon go to barn equipment makers, who are near their active season. A sharp upturn in shipments of fence posts brought the total in February a shade above the total in the same month last year.

Wire Products.—Order mails are heavier than a week ago because of weather, which has been favorable to the merchant trade. Much of the tonnage reaching local mills is from nearby districts. Business in the South remains quiet and it is several weeks too early for the jobbing trade to open in the Northwest. There is a marked improvement in shipments of woven wire fencing. Demand for manufacturers' wire is steady, but the aggregate from week to week is not large.

Prices for wire and wire products, though still showing some variation, seem to be reaching firmer ground at present quotations.

Rails and Track Supplies.—Western rail mills are operating at full capacity and pressure for deliveries is increasing. Several miscellaneous orders for standard-section rails total 3000 tons. Spring track laying activities are expanding and shipments of track supplies are larger. New purchases of accessories this week total 6000 tons.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.07½c. to 2.15c.; angle bars, 2.75c.

Cast Iron Pipe.—This market has a better tone as a result of an increase in orders and inquiries, but prices do not show the stability of a week ago.

Detroit will open bids on March 10 on 1200 tons of 6-in., 1700 tons of 8-in., both to be bell and spigot pipe, and 5000 ft. of 6-in. plain end pipe. Canton, Ohio, will take tenders March 12 on 2000 ft. of 4-in., 10,000 ft. of 6-in., 1000 ft. of 8-in. and 1000 ft. of 12-in. pipe. Inquiries in small tonnages from contractors are more numerous.

The McWane Cast Iron Pipe Co. has been awarded 100 tons of cast iron pipe by Wakeeney, Kan., and also 8000 ft. of 4 to 8-in. pipe by Fort Dodge, Iowa. The United States Pipe & Foundry Co. has taken 175 tons of 14-in. pipe for Laurel, Mont., and 56,000 ft. of 6 to 12-in. pipe for St. Louis Park, a suburb of Minneapolis, Minn. The Central Foundry Co. has taken 150 tons of 6-in. pipe for Madison, Wis., and the American Cast Iron Pipe Co. will furnish 400 tons of 24-in. pipe to Minneapolis, Minn.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $45.20 to $46.20; 4-in., $48.20 to $49.20; Class A and gas pipe, $3 extra.

Reinforcing Bars.—The most lively subject in this market is that of road construction and the tonnage of reinforcing bars involved. Iowa has a well developed plan on which part of the bars has been placed. Indiana is also planning much new work. Illinois will construct 750 miles of new concrete highway and will take extra bars for maintenance work. Dealers expect bids to be asked for on at least 250 miles of the Illinois program by March 15. In addition to the above, Cook County, Ill., has available about $8,000,000 for road work. Chicago still remains a dead spot in sizable tonnage business. Although several large inquiries are before the trade, the bulk of business in the local market is in very small lots. The situation is somewhat better in the small cities tributary to the Chicago market. Shop operations are at an extremely low level and deliveries are prompt.

Sheets.—The Chicago sheet market continues to show an improved tone resulting from larger buying and specifications. Price advances that were contemplated a week ago have not been put into effect, though this move is still being studied by some producers. Current business is coming from all quarters with the exception of the Southwest, which is seasonably slow in taking sheet tonnages.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.80c. to 2.90c.; No. 24 galv., 3.45c. to 3.55c.; No. 10 blue ann'l'd, 2.25c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Bolts, Nuts and Rivets.—Second quarter contracting is under way at unchanged discounts. February shipments fell behind the January figure by 10 per cent. Part of this was due to the shorter month, but there were also urgent requests for deliveries to round stocks which had been depleted near the end of the old year.

Coke.—Interest in this market centers around shipments, which are well sustained at the average of recent weeks. Prices remain steady at $8 a ton, local ovens, with buying light in view of the fact that this commodity is usually purchased for half-year periods.

Warehouse Business.—Local warehouses are announcing quantity differentials to apply on bars, bar-size shapes, bands, hoops, plates, structural shapes, blue annealed sheets, galvanized sheets and one pass cold-rolled sheets. Base prices remain the same.

For an order of 399 lb. and under the extra is 50c. per 100 lb. over base; for 400 lb. to 3999 lb. the base price rules; for orders of 4000 lb. to 8000 lb. the price is 15c. below base; for 8000 lb. to 15,000 lb., 25c. below base, and for 15,000 lb. and over the differential is 35c. per 100 lb. below base.

An order may cover one of the above products or it may include a combination of all the products listed as coming under this plan of quantity differentials.

Old Material.—Prices for scrap iron and steel are sagging, as dealers press sales at quotations which are off 25c. a ton in most cases. Mills are being offered heavy melting steel at $13.75 a ton, delivered.

Moderate weather recently has resulted in much scrap being brought into the market and users are having little difficulty in getting tonnages when needed. This situation is leading dealers to make frequent offerings to melters, who sense the freer supplies and expect lower prices.

Cast iron borings are off 75c. a ton on heavy sales to consumers and malleable grades are off 25c.

The Santa Fe will sell 6000 tons of scrap and the Chicago & North Western is offering 5000 tons.

Prices deliv'd Chicago district consumers:

	Per Gross Ton
Basic Open-Hearth Grades:	
Heavy melting steel	$13.25 to $13.75
Shoveling steel	13.25 to 13.75
Frogs, switches and guards, cut apart, and misc. rails	14.00 to 14.50
Hydraul. compressed sheets	12.25 to 12.75
Drop forge flashings	9.75 to 10.25
No. 1 busheling	11.00 to 11.50
Forg'd cast and r'l'd steel carwheels	18.25 to 18.75
Railroad tires, charg. box size	18.00 to 18.50
Railroad leaf springs cut apart	18.00 to 18.50
Acid Open-Hearth Grades:	
Steel couplers and knuckles	16.00 to 16.50
Coil springs	18.25 to 18.75
Electric Furnace Grades:	
Axle turnings	12.75 to 13.25
Low phos. punchings	15.50 to 16.00
Low phos. plates, 12 in. and under	15.50 to 16.00
Blast Furnace Grades:	
Axle turnings	10.75 to 11.25
Cast iron borings	9.75 to 10.25
Short shoveling turnings	10.00 to 10.50
Machine shop turnings	7.75 to 8.25
Rolling Mill Grades:	
Iron rails	14.00 to 14.50
Rerolling rails	15.00 to 15.50
Cupola Grades:	
Steel rails less than 3 ft.	17.50 to 18.00
Steel rails less than 2 ft.	18.50 to 19.00
Angle bars, steel	15.75 to 16.25
Cast iron carwheels	15.00 to 15.50
Malleable Grades:	
Railroad	17.25 to 17.75
Agricultural	15.25 to 15.75
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.	26.00 to 31.00
	Per Net Ton
Rolling Mill Grades:	
Iron angle and splice bars	14.50 to 15.00
Iron arch bars and transoms	17.00 to 17.50
Iron car axles	25.00 to 25.50
Steel car axles	16.50 to 17.00
No. 1 railroad wrought	12.25 to 12.75
No. 2 railroad wrought	11.75 to 12.25
No. 1 busheling	9.00 to 9.50
No. 2 busheling	7.25 to 7.75
Locomotive tires, smooth	14.50 to 15.00
Pipes and flues	9.25 to 9.75
Cupola Grades:	
No. 1 machinery cast	13.75 to 14.25
No. 1 railroad cast	13.25 to 13.75
No. 1 agricultural cast	11.75 to 12.25
Stove plate	11.00 to 11.50
Grate bars	11.00 to 11.50
Brake shoes	11.00 to 11.50

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel—	
Under 5 tons	2.85c.
5 tons to 30 tons	2.45c.
30 tons and over	2.00c.
Rail steel reinforcement	1.75c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Bands (⅞ in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	4.05c.
Galv. sheets (No. 24)	4.60c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes, ⅜ in. and larger	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.
	Per Cent Off List
Machine bolts	60
Carriage bolts	60
Coach or lag screws	60
Hot-pressed nuts, sq., tap. or blank	60
Hot-pressed nuts, hex., tap. or blank	60
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg.	$2.85 to 2.95
Cement c't'd nails, base per keg	2.85 to 2.95

New York

Steel Demand Slows Up but Prices Are Steadier—Pig Iron Sales in Small Lots

NEW YORK, March 4.—Pig iron demand is increasingly for small lots for spot shipment. Inquiries for good-sized tonnages appear occasionally, but in many cases they are prompted by speculative considerations rather than by larger requirements. In other words, some melters regard pig iron as a "good buy" at present low levels.

Sales in this district totaled only 5500 tons, compared with 8000 tons last week and 9500 tons two weeks ago. Heavier purchases, however, are reported in New England. Sizable inquiries still pending in that market include 1500 tons for the Crane Co., Bridgeport, Conn., 400 tons of No. 1X for another Connecticut melter, 500 tons of No. 2X and 500 tons of No. 1X for the Whitin Machine Works, Whitinsville, Mass., and 500 tons each of the same grades for the Universal Winding Co., Providence, R. I. The H. B. Smith Co., Westfield, Mass., is still sounding out the market for 5000 to 6000 tons.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$20.91 to $21.41
*Buff. No. 2, del'd east. N. J.	19.28 to 19.78
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	19.39 to 21.02
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	19.89 to 21.52

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.
*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Cast Iron Pipe.—Northern and Southern producers of pressure pipe are maintaining prices with considerable firmness, although buying in this district is still rather limited, private users having in most cases completed their contracts and municipal buyers being in the market only for small tonnages.

The Department of Purchase, New York, will open bids March 10 on a tonnage of cast iron pipe, valves, fire hydrants and other accessories. New Bedford, Mass., is inquiring for about 3000 tons of large-size pipe; Coraopolis, Pa., is in the market for 250 tons of 4 to 10-in. pipe; Schenectady, N. Y., is inquiring for 100 tons of 6-in. pipe, and Batavia, N. Y., is taking bids on 40 tons of 4 to 6-in. pipe.

Current quotations of Northern foundries range from $36 to $37 a net ton, f.o.b. foundry.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $38.60 to $39.60; 4-in. and 5-in., $41.60 to $42.60; 3-in., $48.60 to $49.60. Class A and gas pipe, $3 extra.

Warehouse Business.—The quotation on blue annealed sheets from stock has been reduced 30c. per 100 lb. to 3.60c. per lb., base, for No. 10 gage. As blue annealed sheets are subject to the quantity differential, this brings the price for 15,000 lb. or more to 3.20c. per lb., base. Business has begun to show some improvement, although buying of structural material by small fabricators is lagging. Competition for bolt and screw business is keen and additional discounts of 5 and occasionally 10 per cent are commonly offered for desirable orders.

Old Material.—Brokers continue to pay $15 a ton, delivered eastern Pennsylvania consumers, for No. 1 heavy melting steel, and $13 a ton, delivered, for No. 2 steel to go to Phoenixville, Pa., and Conshohocken, Pa. A large eastern Pennsylvania steel mill consumer of scrap, which is preparing a considerable part of its own requirements, is offering dealers in the New York and New England districts $7 to $7.50 a ton, f.o.b. point of origin, for unprepared steel.

An eastern Pennsylvania mill is reported to have closed on upward of 15,000 tons of No. 1 heavy melting steel at $15.50 a ton, delivered. Heavy breakable cast scrap shows a slight advance, with brokers paying $10 a ton, New York, for delivery to a Harrisburg, Pa., mill and $10.50 a ton, New York, for a Florence, N. J., foundry consumer. Chemical borings are being bought at $12 a ton, delivered Bound Brook, N. J., the freight rate from the New York district being $2.02 a ton.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel..	$11.50
Heavy melting steel (yard)	$7.75 to 8.50
No. 1 hvy. breakable cast.	10.00 to 10.50
Stove plate (steel works).	8.00
Locomotive grate bars....	8.25
Machine shop turnings....	7.00 to 7.50
Short shoveling turnings..	7.25 to 7.50
Cast borings (blast fur. or steel works).....	7.00 to 7.50
Mixed borings and turnings	6.75 to 7.50
Steel car axles.....	16.25 to 17.25
Iron car axles.....	20.50 to 21.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	9.25 to 9.75
Forge fire	8.50 to 9.00
No. 1 railroad wrought...	11.50 to 12.00
No. 1 yard wrought, long..	10.50 to 11.50
Rails for rolling.....	10.50 to 11.00
Stove plate (foundry)....	8.75 to 9.00
Malleable cast (railroad)..	12.00 to 12.50
Cast borings (chemical)..	9.50 to 10.00

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast.....	$15.00
No. 1 hvy. cast (columns, bldg. materials, etc.), cupola size.....	13.00
No. 2 cast (radiators, cast boilers, etc.)	12.50

Finished Steel.—Demand for steel products has flattened out in the past week, and the decline in buying locally cannot be attributed to any great extent to the lessened activity in the automobile industry. Some of the railroads are curtailing purchases for repair work, presumably on the ground that increases in car loadings may come slowly and that rehabilitation of equipment need not be rushed.

Railroad equipment buying does not look very promising for the early future, though it is expected that the New York Central may come into the market by April or May for about 5000 cars. There is some doubt now whether the Seaboard Air Line will purchase the 2000 cars on which it has received bids.

Structural steel contracting in the New York district was not large during the week, but inquiries are increasing in number. An office building at Broadway and Thirty-ninth Street, calling for 4000 tons, has been awarded to the Harris Structural Steel Co. and a home for incurables, requiring 2000 tons, will be fabricated by the Levering & Garrigues Co.

The price structure is firmer. East-

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes.....	3.30c.
Soft steel bars, small shapes.....	3.25c.
Iron bars	3.24c.
Iron bars, Swed. charcoal..7.00c. to	7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons.....	3.40c.
Flats and squares.....	3.90c.
Cold-roll. strip, soft and quarter hard	5.05c.
Hoops	4.25c.
Bands	3.75c.
Blue ann'l'd sheets (No. 10).....	3.60c.
Long terne sheets (No. 24).....	5.80c.
Standard tool steel.....	12.00c.
Wire, black annealed.....	4.50c.
Wire, galv. annealed.....	5.15c.
Tire steel, ½ x ½ in. and larger...	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases,	4.50c. to 7.00c.

	Per Cent Off List
Machine bolts, cut threads:	
¾ x 6 in. and smaller.....	60
1 x 30 in. and smaller..	50 to 50 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller.....	60
¾ x 20 in. and smaller..	50 to 50 and 10
Coach Screws:	
½ x 6 in. and smaller.....	60
1 x 6 in. and smaller..	50 to 50 and 10

	Per 100 Ft.
Boiler Tubes—	
Lap welded, 2-in.....	$19.00
Seamless steel, 2-in.....	20.25
Charcoal iron, 2-in.....	26.25
Charcoal iron, 4-in.....	67.00

Discounts on Welded Pipe

Standard Steel—	Black	Galv.
⅛-in. butt.....	46	29
¼-in. butt.....	51	37
1-3-in. butt.....	53	39
2½-6-in. lap.....	48	35
7 and 8-in. lap.....	44	17
11 and 12-in. lap.....	37	12
Wrought Iron—		
⅛-in. butt.....	5	+19
¼-in. butt.....	11	+ 9
1-1½-in. butt.....	14	+ 6
2-in. lap.....	5	+14
3-6-in. lap.....	11	+ 6
7-12-in. lap.....	3	+16

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box...	$6.45	$6.20
Charcoal, per Box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

Terne Plate (14 x 20 in.)

IC—20-lb. coating.....	$10.00 to $11.00
IC—30-lb. coating.....	12.00 to 13.00
IC—40-lb. coating.....	13.75 to 14.25

Sheets, Box Annealed—Black, C. R. One Pass

	Per Lb.
Nos. 18 to 20.....	3.60c. to 3.70c.
No. 22.....	3.75c. to 3.85c.
No. 24.....	3.80c. to 3.90c.
No. 26.....	3.90c. to 4.00c.
No. 28*.....	4.05c. to 4.15c.
No. 30.....	4.30c. to 4.40c.

Sheets, Galvanized

	Per Lb.
No. 14.....	4.00c. to 4.15c.
No. 16.....	3.85c. to 4.00c.
No. 18.....	4.00c. to 4.15c.
No. 20.....	4.10c. to 4.25c.
No. 22.....	4.20c. to 4.35c.
No. 24†.....	4.35c. to 4.50c.
No. 26.....	4.60c. to 4.75c.
No. 28*.....	4.85c. to 5.00c.
No. 30.....	5.25c. to 5.40c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.
†For 50 bundles or more, 25c. per 100 lb. or less.

ern plate mills are sticking closely to 2.07½c., delivered New York, on most sales, though this price is occasionally shaded. Structural shapes seem to be steady at 2.04½c., New York. Concessions are less frequent on sheets, and 2.65c., Pittsburgh, on black appears to be the minimum.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.19c.; plates, 2.07½c. to 2.12½c.; structural shapes, 2.04½c. to 2.09½c.

Coke.—Shipments of foundry coke on current contracts have been increased by some consumers. Prices are unchanged, with special brands of beehive coke at $4.85 a net ton, ovens, or $8.56, delivered to northern New Jersey, Jersey City and Newark and $9.44 to New York and Brooklyn. Standard furnace coke prices lack strength and the market for prompt shipment ranges from $2.50 to $2.65 a net ton, Connellsville. By-product foundry coke is quoted at $9 to $9.40, Newark or Jersey City; $10.06, New York or Brooklyn.

Cleveland

Steel Demand Slower in All Lines—Higher Prices on Some Grades of Sheets Named

CLEVELAND, March 4.—Demand for finished steel is slow in all lines. There has been little change in the volume of business since the automotive industry started two weeks or more ago to curtail operations. This industry has extended deliveries on some of the steel for which it had issued specifications, is giving few new releases and has made few commitments for April shipment, although such products as alloy steel bars and automobile body sheets require some time in going through the manufacturing processes.

While curtailment has not been sharp, most of the motor car manufacturers have reduced their production schedules and are making frequent changes in these schedules instead of following their usual practice of operating on a set schedule for about 30 days. In doing this they are putting in effect the policy announced by some of the car manufacturers at the start of the year of limiting production to the demand. Dealers now have good stocks and are not selling many cars, as it is too early for spring buying to get under way.

Business in most lines outside of the automotive industry is rather slow, and steel orders are for small lots for early requirements.

Both steel plant and finishing mill operations have been curtailed in this territory. Five open-hearth furnaces in Cleveland were shut down during the week, and the local independent mills are now operating at 75 per cent of ingot capacity, as compared with 90 per cent a month ago.

Announcements of second quarter prices on a number of products were made during the week. Blue annealed and auto body sheets and hot and cold-rolled strip steel have been established at the recent prices, which are $2 a ton lower than those that prevailed at the start of the quarter. A $2 a ton advance announced on black and metal furniture sheets brings prices on these grades back to where they were at the end of the year. Wire rods have been marked down $1 a ton for the coming quarter. Present prices on wire products have been reestablished.

Pig Iron.—The market is not showing much life, although sales by Cleveland interests during the week, aggregating 19,500 tons, were somewhat larger than those of the previous week. While some of the business was in contracts for the second quarter, many foundries are still buying only for immediate needs. Inquiry is light.

Shipping orders from the automotive industry for March show a decline as compared with February, but producers expect that this falling off will be made up at least in part by increased demand from other consumers. Some of the makers of road-building machinery are very busy and are taking pig iron in good volume, and heating equipment and stove foundries are fairly busy. Some of the automobile foundries, instead of scheduling iron for shipment for a month, are ordering either only from day to day or at the most for one or two weeks. This is due to the present uncertain situation in the automotive industry.

Prices are steady and unchanged. Cleveland furnaces are quoting foundry and malleable iron at $18.50 for outside shipment and do not seem disposed to seek business in competitive territories where they would have to go to $18 to absorb part of the freight rate. For Cleveland delivery, the market is firm at $19, furnace. In Michigan, the range is unchanged from $19.50 to $20. Differentials are not being strictly adhered to.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$19.50
S'th'n fdy., sil. 1.75 to 2.25	19.51
Malleable	19.50
Ohio silvery, 8 per cent	28.00
Basic Valley furnace	18.50
Stand. low phos., Valley	$26.50 to 27.00

Prices except on basic and low phosphorus are delivered Cleveland. Freight rates: 50c. from local furnaces; $3 from Jackson, Ohio; $6.01 from Birmingham.

Strip Steel.—Present prices on hot and cold-rolled strip steel have been named for the second quarter by several producers. The market appears well stabilized at the prevailing prices of 1.80c., Pittsburgh, for wide strip and 1.90c. for narrow. The reestablished prices on cold-rolled strip are 2.65c., Pittsburgh and Cleveland, and 4c. for fender stock. Reports indicate some weakness on cold-rolled strip for good-sized lots. Demand for strip is light both in new business and in specifications against contracts.

Bars, Plates and Shapes.—Specifications for these products show little change as compared with the previous week, but the demand, particularly for steel bars, is considerably lighter than in January and early February. Mills are getting a good many orders but only for small lots.

There is some improvement in the building field. An inquiry is out for the Akron Young Men's Christian Association building, and changes made in the design increased the steel requirements to 2000 tons or more.

Steel bars are well stabilized at 1.85c., Cleveland. For plates and structural shapes, 1.85c., Pittsburgh, is the price on most business. A Cleveland plate mill has named that price for the second quarter.

Semi-Finished Steel.—Orders for sheet bars for making automobile body sheets have declined sharply, and production has been curtailed. Business is limited to specifications against contracts. The $33 price for sheet bars, billets and slabs will probably be named for the second quarter. Wire rods have been reduced for the second quarter.

Sheets.—Present ruling prices on sheets will probably prevail through the second quarter on all grades except black, metal furniture and possibly galvanized sheets. A few of the mills have formally announced as prices for the coming quarter 2.75c., Pittsburgh, for black; 2.10c. for No. 10 and 2.25c. for No. 13 blue annealed; 2c. for No. 10 and 2.15c. for No. 13 continuous mill sheets; 3.90c. for auto body and vitreous enameling stock, and 4c. for metal furniture sheets which now are commonly quoted at 3.90c. There had been some talk of trying to put auto body sheets back to 4c. Sheet business is light. Black sheets now appear firm at 2.65c. On galvanized sheets, 3.30c. is still the ruling price.

Wire Products.—Some of the mills have announced the reestablishment of present prices for the second quarter. Occasionally a concession of $2 a

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes	3.00c.
Soft steel bars	3.00c.
Reinforc. steel bars	2.25c. to 2.50c.
Cold-fin. rounds and hex.	3.65c.
Cold-fin. flats and sq.	4.15c.
Hoops and bands, No. 12 to ¼ in., inclusive	3.25c.
Hoops and bands, No. 13 and lighter	3.65c.
Cold-finished strip	*5.95c.
Black sheets (No. 24)	3.75c.
Galvanized sheets (No. 24)	4.50c.
Blue ann'l'd sheets (No. 10)	3.25c.
No. 9 ann'l'd wire, per 100 lb.	$2.75
No. 9 galv. wire, per 100 lb.	3.20
Com. wire nails, base per keg	2.65

*Net base, including boxing and cutting to length.

ton from the 2.40c. price is reported on manufacturers' wire. Business is not active as jobbers and retailers are not stocking up. Important changes on wire fence will be announced shortly.

Reinforcing Bars.—Erie, Pa., has placed a contract for a filtration plant requiring 1000 tons, and a fair amount of inquiry has developed for lots of 200 tons and under. The market lacks firmness, and concessions to around 1.75c. are reported on round lots.

Warehouse Business. — Cleveland warehouses may follow Chicago and Detroit jobbers in adopting quantity differentials for hot-rolled steel products, but have made no decision. Warehouse business is light. Some mills are more active than usual in taking small-lot orders. Price concessions attributed to outside jobbers are reported on steel bars in some parts of the territory.

Coke.—A competitive local situation has resulted in a $1 a ton reduction on by-product foundry coke to $5, ovens, for Cleveland delivery of egg size. This reduction is not being generally met by outside producers. Specifications for foundry coke are fair, but there is not much new business. Prices are unchanged. Ohio by-product foundry coke is quoted at $8.25, ovens, for March shipment.

Old Material.—The market has a weaker tone. This is due to curtailment of shipments by local consumers that has resulted from reduction in steel plant operations. There also has been some restriction of shipments of blast furnace scrap. The only sale reported to a consumer is a small tonnage of heavy melting steel to a Valley district mill.

Drop forge flashings have declined 50c. a ton and short shoveling turnings 25c. a ton.

As consumers have good stocks and considerable scrap is still due on contracts, there is nothing to indicate an early revival of activity.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$14.00 to $14.50
No. 2 heavy melting steel	13.25 to 13.75
Compressed sheet steel	13.00 to 13.50
Light bundled sheet stampings	11.50 to 12.00
Drop forge flashings	11.75 to 12.00
Machine shop turnings	10.50 to 11.00
Short shoveling turnings	11.25 to 11.75
No. 1 railroad wrought	13.00 to 13.50
No. 2 railroad wrought	14.00 to 14.50
No. 1 busheling	12.00 to 12.50
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades:	
Low phos., forging crops	17.75 to 18.00
Low phos., billet bloom and slab crops	18.50 to 18.75
Low phos., sheet bar crops	18.00 to 18.50
Low phos., plate scrap	18.00 to 18.50
Blast Furnace Grades:	
Cast iron borings	10.50 to 11.00
Mixed borings and short turnings	10.50 to 11.00
No. 2 busheling	10.00 to 10.50
Cupola Grades:	
No. 1 cast	15.25 to 15.75
Railroad grate bars	11.00 to 12.00
Stove plate	12.00 to 12.50
Rails under 3 ft	18.50 to 19.50
Miscellaneous:	
Railroad malleable	16.00 to 16.50
Rails for rolling	16.25 to 16.50

Philadelphia

Steel Orders Decrease—Southern Competition in Pig Iron Brings 50c. a Ton Reduction

PHILADELPHIA, March 4.—New business booked by steel mills of this district in the past week decreased considerably, but operating rates show only a slight recession at certain mills, and prices are being maintained with a minimum of concessions on desirable orders.

The railroads are still the chief contributors of substantial business on mill books, but public utilities are fairly active buyers of steel pipe and gas tubing, and manufacturers of generators and other large electrical equipment have been increasingly active. Automobile body builders, radio manufacturers and other branches of industry in this district are less active than a month ago.

The Norfolk & Western Railroad is inquiring for about 8000 tons of plates, shapes and bars to build 500 cars in its own shops in Roanoke, Va.

Shipbuilders have available space in their production schedules for more tonnage, but are not filling their books with some of the smaller shipbuilding work offered at present, preferring to wait for the larger construction expected to result from new ocean mail contracts. Low bidders for these contracts at the recent opening in Washington were the Colombian Steamship Co., Panama Mail Steamship Co., United Fruit Co., United States Lines and Grace Steamship Co.

Pig Iron.—Competition from Southern producers is rather generally encountered on any substantial pig iron business, and, to prevent loss of most of the desirable foundry iron orders to the Birmingham district, eastern Pennsylvania furnaces have found it necessary to shade $20 a ton, base, by about 50c. On carloads to 100 tons, $20 a ton, base, is usually obtained.

A recent purchase by a new consumer of foundry iron in Camden, N. J., totaled about 2000 tons, of which 1500 tons went to an eastern Pennsylvania maker and 500 tons to a Southern furnace, although the original intention of the buyer was to place the larger part with a Southern interest in expectation of a considerably lower price.

Stocks of pig iron in the Birmingham district are estimated to be in excess of 350,000 tons. A Birmingham district producer of pig iron is reported to have closed a contract for about 35,000 tons of pig iron for export to Japan.

The Keystone furnace of the Reading Iron Co. has been blown out for relining and other repairs, as the furnace has been operating with the present lining for more than two years.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$20.26 to $20.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	20.76 to 21.26
East. Pa. No. 1X	21.26 to 21.76
Basic (del'd east. Pa.)	19.25 to 19.50
Malleable	21.25 to 21.75
Stand. low phos. (f.o.b. east. Pa. furnace)	24.00
Cop. b'r'g low phos. (f.o.b. furnace)	23.00 to 24.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Bars. — Quotations continue at 1.85c. to 1.90c. a lb., Pittsburgh, or 2.17c., delivered Philadelphia, with most of the present buying limited to carload lots and less. About 1000 tons is being inquired for by the Norfolk & Western Railroad for use in building 500 cars at its Roanoke shops.

Reinforcing Bars. — Construction projects are not numerous, but the few in the market call for fair tonnages of bars. A public school at Thirty-third and Tasker Streets, Philadelphia, will require 700 tons, and a second section of a concourse under the City Hall, Philadelphia, bids on which will be opened March 21, calls for 400 tons.

Prices are substantially unchanged at 1.90c. to 1.95c., Pittsburgh, or 2.22c. to 2.27c., delivered Philadelphia, with no extra for cutting to length. Rail steel bars are quoted at 1.75c., Franklin, Pa., and Tonawanda, N. Y., or 2.07c., delivered Philadelphia, with no extra for cutting to length or bending.

Shapes.—Although tonnage booked in the past week was small and mills have little backlog, prices are being maintained at 1.80c. to 1.85c. a lb., f.o.b. nearest mill to consumer, or 1.86c. to 1.91c., delivered Philadelphia.

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.70c.
Plates, $\frac{7}{16}$-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands)	2.80c.
Round-edge iron	3.50c.
Round-edge steel, iron finished 1½ x 1½ in.	3.50c.
Round-edge steel planished	4.30c.
Reinforc. steel bars, sq., twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex.	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.55c.
Steel bands, No. 12 to $\frac{7}{16}$-in. inclus.	3.30c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.80c.
†Galvanized sheets (No. 24)	4.45c.
Light plates, blue annealed (No. 10)	3.25c.
Blue ann'l'd sheets (No. 13)	3.40c.
Diam. pat. floor plates—	
¼-in.	5.30c.
$\frac{7}{16}$-in.	5.50c.
Rails	3.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

Small lots and special specifications occasionally bring 1.90c., f.o.b. mill, or 1.96c., delivered Philadelphia. About 2000 tons of shapes will be required by the Norfolk & Western Railroad in building 500 cars in its own shops.

Plates.—Mills are maintaining 1.90c. a lb., Coatesville, Pa., or 2c., delivered Philadelphia, with most of the current buying limited to small lots. Car builders and the railroads offer the best prospects for immediate business, with shipbuilding tonnage still some weeks away. Eastern Pennsylvania mills are bidding on about 5000 tons of plates required by the Norfolk & Western Railroad for 500 cars to be built in its Roanoke, Va., shops.

Sheets. — Consumers of sheets in this district are in most cases operating on a restricted scale, especially automobile body builders, which have contracts with Detroit manufacturers. Car builders and the railroads are providing some business in blue annealed plates and a builder of large electrical equipment in Camden, N. J., has been a buyer of electrical sheets recently, a result of increased operations.

Blue annealed sheets are quoted at 2.25c. a lb., base, Pittsburgh, or 2.57c., delivered Philadelphia, for No. 13 gage, and blue annealed plates are 2.10c., Pittsburgh, or 2.42c., delivered Philadelphia, for No. 10 gage. Some mills have announced 2.75c., Pittsburgh, or 3.07c., Philadelphia, for black sheets, delivered during the rest of this month or for the second quarter, but other mills are still quoting 2.65c., Pittsburgh, or 2.97c., Philadelphia. Galvanized sheets are unchanged at 3.30c., Pittsburgh, or 3.62c., Philadelphia.

Imports.—In the week ended March 1, 1246 tons of pig iron from British India and 100 tons of spiegeleisen from the United Kingdom arrived at this port. Steel arrivals consisted of 45 tons of steel rods, 28 tons of steel billets, 27 tons of bearing steel and 13 tons of bearing tubing from Sweden, 139 tons of structural shapes, 73 tons of steel bars and 15 tons of bands from Belgium, and 250 tons of steel strips from France.

Old Material.—With a sale of upward of 15,000 tons of No. 1 heavy melting steel to an eastern Pennsylvania consumer at $15.50 a ton and 7000 to 8000 tons to another mill in this district at $15 a ton, delivered, the market is quotable at $15 to $15.50. Despite the advance in price, brokers report a fair tonnage of material obtainable at present at a buying price of $15 a ton, delivered. No. 2 heavy melting steel is being bought at $11.50 a ton, delivered Pottsville, Pa., and $13 a ton, delivered Phoenixville, and Conshohocken, Pa., although no sales are reported to have been made at higher than these prices.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$15.00 to	$15.50
Scrap T rails		14.50
No. 2 heavy melting steel	$11.50 to	13.00
No. 1 railroad wrought	15.00 to	15.50
Bundled sheets (for steel works)		11.50
Hydraulic compressed, new	13.50 to	14.50
Hydraulic compressed, old	12.50 to	13.50
Machine shop turnings (for steel works)		11.50
Heavy axle turnings (or equiv.)	12.50 to	13.50
Cast borings (for steel works and roll. mill)		11.25
Heavy breakable cast (for steel works)		14.00
Railroad grate bars	11.50 to	12.50
Stove plate (for steel works)	11.50 to	12.50
No. 1 low phos., hvy., 0.04% and under	20.50 to	21.50
Couplers and knuckles	19.00 to	19.50
Rolled steel wheels	19.00 to	19.50
No. 1 blast f'nace scrap	10.50 to	11.00
Wrot. iron and soft steel pipes and tubes (new specific.)		14.00
Shafting		19.00
Steel axles	21.00 to	21.50
No. 1 forge fire	13.00 to	13.50
Cast iron carwheels		15.00
No. 1 cast	15.00 to	15.50
Cast borings (for chem. plant)		14.00
Steel rails for rolling	15.00 to	15.50

Railroad Equipment

American Refrigerator Transit Buys 1000 Cars

ORDERS for more than 1000 cars were placed in the past week, 1000 by the American Refrigerator Transit Co., 75 by the North American Car Corporation and two smaller orders. Inquiries were issued for 295 cars.

There is a possibility that the Seaboard Air Line may not buy the 2000 cars on which it has recently received bids.

Details of the week's business follow:

Elgin, Joliet & Eastern is inquiring for eight 2-8-2 type locomotives.

Illinois Terminal is inquiring for two locomotives of 2-8-2 type.

Alaska Railroad has ordered one rotary snow plow from American Locomotive Co.

Canadian Pacific will build five single snow plows and three double snow plows in its Angus shops and has ordered 10 locomotive tenders from Montreal Locomotive Works.

Georgia, Ashburn, Sylvester & Camilla has ordered one 2-8-2 type locomotive from Baldwin Locomotive Works.

Newfoundland Railway is inquiring for 50 30-ton box cars.

National Tube Co. has ordered three special flat cars from Greenville Steel Car Co.

White Eagle Oil & Refining Co. of America is inquiring for 25 8000-gal. tank cars.

Eastern Michigan Railways have ordered 10 Hart convertible ballast cars from American Car & Foundry Co.

Norfolk & Western will build 500 box cars at its Roanoke shops and is asking for prices on 1000 hopper car bodies.

Chicago, Burlington & Quincy will build 10 baggage cars in its own shops.

Gulf, Mobile & Northern has ordered two combination passenger and baggage gas-electric rail motor cars from J. G. Brill Co.

Amiesite Asphalt Co. of America is inquiring for five 50-ton flat cars.

Stonega Coal Co. has ordered 400 mine cars from Sanford-Day Iron Works, Knoxville, Tenn.

New York, New Haven & Hartford is inquiring for 15 40-ton coke cars.

North American Car Corporation has ordered 75 insulated tank cars from Pressed Steel Car Co.

American Refrigerator Transit Co. has ordered 800 refrigerator and 200 brine cars from Mount Vernon Car & Mfg. Co.

Union Pacific will buy two 300-hp. gas-electric motor cars and two trailers.

Rock Island Refining Co. will buy 200 tank cars.

Scrap Institute Meets in Chicago

The Institute of Scrap Iron and Steel, opening its second annual convention in Chicago on Tuesday, with an attendance of nearly 100 scrap dealers and brokers, discussed at length methods of procedure on complaints against violators of the institute's code of business practices. Stress was laid on the importance of building up confidence among consumers of scrap and obtaining their cooperation.

Twenty-three violations have been handled since last July, it was stated. Twelve of these involved doctoring of cars, two defaming of competitors, two for bribery. Five letters of warning were issued, two members were expelled, several cases were withdrawn or dismissed, and eight cases are still pending. Fifteen of the complaints were filed by consumers, six by members and two by chapters. Thirteen defendants were members of the institute and 10 were not.

It was reported that 175 firms have adopted the institute's code of practice. Of these, 110 are members.

A resolution was adopted to permit the executive committee to employ an investigator not connected with the scrap trade to investigate complaints.

Cleveland and Chicago Nut Makers to Merge

Consolidation of the Cleveland Wrought Products Co., Cleveland, and the Chicago Nut Mfg. Co., Chicago, has been agreed upon by the directors of the two companies and will be submitted to the stockholders March 20 for approval.

The two companies will be merged under the name of the United Screw & Bolt Corporation, a new Ohio corporation which will have assets of approximately $1,775,000 in capital stock and surplus.

The Cleveland company manufactures cap and set screws and machine screw nuts in steel and brass.

All the officers of the new company are present officers of the two companies.

Charles L. Wasmer, president of the Cleveland company, will be chairman of the board, and E. A. Thatcher, president of the Chicago company, will be president. Carl E. Kramer, Cleveland, will be vice-president and C. C. Brinkerhoff and V. H. Wilde, Chicago, will be secretary and treasurer respectively.

Pacific Coast

Steel Buying Mostly in Small Lots But Total Volume Is Fairly Good—Plate Prices Weak

SAN FRANCISCO, March 1.—(*By Air Mail*)—Business in steel products on the Pacific Coast during the past week was mostly in small tonnages, though a fair volume in the aggregate was booked. The larger lettings were 270 tons of structural shapes for a library in Berkeley, Cal., placed with the Pacific Coast Engineering Co., 950 tons of plates for tanks for the Standard Oil Co., secured by the Western Pipe & Steel Co., and 200 tons of Universal cast iron pipe for the Pacific Lumber Co., Scotia, Cal., placed with the Central Foundry Co.

As the spring season approaches, more construction work is coming up for figures, and the outlook is encouraging. The price situation is on a fairly firm basis, except for plates, which are weak.

Pig Iron.—Little improvement is noted in the rate of operations among jobbing foundries. Pig iron prices are unchanged.

Prices per gross ton at San Francisco:

*Utah basic	$25.00 to $26.00
*Utah fdy., sil. 2.75 to 3.25	25.00 to 26.00
**Indian fdy., sil. 2.75 to 3.25	25.00 to 26.00

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

Bars.—Demand for reinforcing steel bars is improving and awards this week involved numerous projects, most of which, however, were in lots of less than 100 tons. The W. S. Wetenhall Co. took 175 tons for a dormitory at Santa Clara, Cal., and 100 tons for a bank building in Salinas, Cal. The Pacific Coast Steel Corporation secured 110 tons for two warehouses on Goat Island, San Francisco, for the Government. The Concrete Engineering Co. booked 135 tons for a library in Berkeley and 105 tons for a school building in San Rafael. The Clinton Construction Co. got the general contract for a hospital at the Presidio, San Francisco, involving 350 tons of bars. Pending business is of fair proportions. Prices on out-of-stock material in the San Francisco district continue unchanged at 2.30c., base, on carload lots and at 2.60c. on smaller quantities. Prices in the Los Angeles district are $2 a ton higher. Merchant bar steel continues to move in small lots only and the price on this class of material remains unchanged at 2.35c., c.i.f. coast ports.

Plates.—Bids were opened this week on 1200 tons for a welded steel pipe line at Tacoma, Wash. It is reported that some exceptionally low prices were received on the plates. Quotations at present are general at 2.20c., base, c.i.f. coast ports. The Western Pipe & Steel Co. took 950 tons for two 134,000 bbl. and two 93,000 bbl. shells for the Standard Oil Co. to be erected at San Luis Obispo, Cal. No action has yet been taken by the Standard Oil Co. on its inquiry for 640 tons, and it is reported that the inquiry will be withdrawn and that the company will ask for bids from tank fabricators. In the past the company has done most of its own work.

Shapes.—While large lettings of structural material were not numerous, a good volume of business, involving small lots was booked by fabricators. The Herrick Iron Works took 250 tons for two power houses for the Pacific Gas & Electric Co., one at Salt Creek and the other at Tiger Creek, Cal. The McClintic-Marshall Co. booked 130 tons for an apartment on Hays Street, San Francisco. General contracts have been placed on an addition to the State Building, San Francisco, involving 230 tons, and on a hospital in the Presidio, San Francisco, calling for 1400 tons. Subcontracts for the steel should be placed within the next week or 10 days. A bridge over the Sank River in Washington was placed with an unnamed interest. Plain material continues firm at 2.35c., c.i.f. coast ports.

Cast Iron Pipe.—Improvement in demand for cast iron pipe is noted. Awards this week included 150 tons of 8-in. Class 150 pipe for the King County, Seattle, airport, booked by the American Cast Iron Pipe Co., Portland, Ore. will open bids March 11 on 3675 tons. The United States Pipe & Foundry Co. was low bidder on 350 tons of 20-in. Class B pipe for the East Bay Municipal Utility District, Oakland. San Diego will open bids March 10 on 141 tons of 6 and 8-in. Class B pipe for Yell Street. Pending business now exceeds 7300 tons.

Steel Pipe.—Movement of standard steel pipe is light. No large pipe line inquiries are up for figures. Activity in the oil fields remains quiet, with the result that demand for oil country goods is practically at a standstill.

Track Material.—The Oakland Port Commission, Oakland, has awarded the United States Steel Products Co. about 500 tons of track material, including tie plates, frogs and switches, track bolts and spikes and 160 tons of 128 lb. girder rails and 140 tons of 90 lb. standard T-rails. Bids will be opened on March 22 by the Spokane, Portland & Seattle Railway Co., Portland, Ore., for six tenders and four locomotives of the 2-8-0 and 4-6-2 type.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.30c.
Soft steel bars	3.30c.
Small angles, ⅞-in. and over	3.15c.
Small angles, under ⅞-in.	3.55c.
Small channels and tees, ¾-in. to 2¾-in.	3.75c.
Spring steel, ¼-in. and thicker	5.00c.
Black sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.90c.
Galv. sheets (No. 24)	5.30c.
Struc. rivets, ⅛-in. and larger	5.65c.
Com. wire nails, base per keg	$3.40
Cement c't'd nails, 100 lb. keg	3.40

Birmingham

Pig Iron Sales Show a Slight Improvement—Steel Backlogs Well Maintained

BIRMINGHAM, March 4.—Pig iron consumers who underestimated their requirements and those who have been following the order-as-needed policy are buying for March delivery, and sales are averaging a little better than two weeks ago. Inquiries for second quarter iron have developed steadily during the past two weeks, though interest in the next period cannot be termed strong. Light stocks of consumers and recent close buying are factors that give producers hope of a good buying movement when books are opened for the second quarter. February shipments were at a rate comparable with production, certainly not less than production. Current shipments to outside territories are the best of the year. Prices for district iron are unchanged from the $15 base. There has been no change in the 17 active furnaces during the past two weeks. Eleven furnaces are on foundry iron, five on basic and one on recarburizing iron.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$15.00
No. 1 fdy., 2.25 to 2.75 sil.	15.50
Basic	15.00

Finished Steel.—Though the rate of operations increased in February, backlogs were well maintained. A decline in buying in one or two lines was compensated for by increases in others. The demand for plates for gasoline and oil tanks was reported greater than in any other month on record. Demand for structural shapes and bars continued active. A good portion of current orders will be delivered in the second quarter. Prices are unchanged and show a degree of

firmness. Fabricated structural steel lettings slumped last week. Reinforcing bar makers report that orders are below normal for the season. The Tennessee company is operating eight open-hearths at Ensley and seven at Fairfield, one less than last week. The Gulf States Steel Co. continues to work four at Alabama City.

Cast Iron Pipe.—The Kansas City, Mo., project, calling for 8000 tons of 30 to 36-in. pipe, has been divided between the National Cast Iron Pipe Co. and the United States Pipe & Foundry Co. The latter company has also booked approximately 2000 tons for a utility company at Kansas City. A decline in demand from public utility companies is being offset by better demand from municipalities, and the outlook for spring buying is reported more favorable than it was last year. Pressure pipe makers report they have sold more pipe in the first two months this year than they did in the corresponding period last year. Shipments are moving current production. Prices are the firmest in several months, at $37 to $38 a ton, Birmingham, for 6-in. and larger sizes.

Coke.—The movement of foundry and industrial coke continues lighter than usual for this season. Active by-product ovens total 1201 out of the 1390 available. Prices remain at $5 a net ton, Birmingham.

Old Material.—Demand for scrap still follows closely the requirements of the larger steel mills, these being the only consumers taking material in large amounts. February shipments were slightly under those of January. Prices are unchanged.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$13.00 to $13.50
Scrap steel rails	14.00
Short shoveling turnings	9.00
Cast iron borings	9.00
Stove plate	11.50 to 12.00
Steel axles	22.00
Iron axles	23.00
No. 1 railroad wrought	10.00 to 10.50
Rails for rolling	15.50
No. 1 cast	13.00
Tramcar wheels	12.50
Cast iron carwheels	13.00 to 13.50
Cast iron borings, chem.	13.50 to 14.00

St. Louis

Pig Iron Melt Increasing—Firmer Tone in Southern Market —Steel Recovering from February Lull

ST. LOUIS, March 3.—Renewal of pipe manufacturing activities in Alabama has given a firmer tone to the Southern pig iron market, and some believe that higher prices shortly will result. Improvement in the Southern situation also is expected to help the market for Northern iron, which has had considerable competition lately from Southern makers. One pipe concern in Alabama is now said to be specifying 500 tons of pig iron daily, and others are increasing their melt. Sales of the St. Louis Gas & Coke Corporation for the week amounted to about 7500 tons, mostly for first quarter, but some running into second quarter. Shipments of that maker in February were greater than in January, but less than in February, last year. The melt in the district is said to be steadily increasing.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$19.50 to $20.00
Malleable, f.o.b. Granite City	20.00
N'th'n No. 2 fdy., deliv'd St. Louis	22.16
Southern No. 2 fdy., deliv'd	17.42 to 18.42
Northern malleable, deliv'd	22.16
Northern basic, deliv'd	22.16

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Finished Steel.—After a noticeable slump during the first three weeks in February, the Granite City Steel Co. reports an improvement in demand. Incoming business in tin plate has been exceptionally good. While the demand for galvanized sheets continues light, it is believed that favorable weather conditions should bring an improvement within 30 days. While prices are no higher, they are said to be firmer. The order for 1450 tons of reinforcing bars for the Bagnell, Mo., dam of the Union Electric Light & Power Co., went to the Laclede Steel Co. An increasing number of small orders for reinforcing bars is reported.

Old Material.—The scrap market is slightly easier. Prices in Chicago and Valley markets are lower, and, in addition, milder weather has resulted in heavier shipments from country dealers and a heavier movement of railroad scrap. Buying by consumers this week was light. Wrought iron bars and transoms are off $2 on account of a lack of demand. Railroad lists: Chicago Illinois Midland, 100 tons; Missouri Pacific, 134 carloads; Chicago, Milwaukee, St. Paul & Pacific, 43 carloads; Mobile & Ohio, 14 carloads; Chicago Belt Railway and Chicago Great Western, nine carloads each.

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.75c.
Black sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.30c.
Galv. corrug. sheets	4.90c.
Structural rivets	4.15c.
Boiler rivets	4.15c.

	Per Cent Off List
Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	$13.75 to $14.00
No. 1 heavy melting or shoveling steel	12.50 to 13.00
No. 2 heavy melting or shoveling steel	11.75 to 12.25
No. 1 locomotive tires	14.50 to 15.00
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	13.50 to 14.00
Railroad springs	16.00 to 16.50
Bundled sheets	9.50 to 10.00
No. 2 railroad wrought	12.50 to 13.00
No. 1 busheling	9.75 to 10.25
Cast iron borings and shoveling turnings	9.25 to 9.75
Iron rails	13.00 to 13.50
Rails for rolling	14.00 to 14.50
Machine shop turnings	6.75 to 7.25
Heavy turnings	9.00 to 9.50
Steel car axles	19.50 to 20.00
Iron car axles	26.00 to 26.50
Wrot. iron bars and trans.	21.50 to 22.00
No. 1 railroad wrought	13.00 to 13.50
Steel rails, less than 3 ft.	17.00 to 17.50
Steel angle bars	14.00 to 14.50
Cast iron carwheels	14.00 to 14.50
No. 1 machinery cast	15.25 to 15.75
Railroad malleable	14.50 to 15.00
No. 1 railroad cast	14.00 to 14.50
Stove plate	11.75 to 12.25
Relay. rails, 60 lb. and under	20.50 to 23.50
Relay. rails 70 lb. and over	26.50 to 29.00
Agricult. malleable	13.00 to 13.50

Youngstown

Steel Operations Decline to 70 Per Cent

YOUNGSTOWN, March 4.—Owing to a decline in new business from the automobile industry, the average rate of operations by Youngstown district steel companies has slumped 5 points to a 70 per cent average.

Of 51 independent open-hearth furnaces, 35 are scheduled, against 38 last week and 41 two weeks ago. Sheet and strip capacity is operating at 65 to 70 per cent.

Offsetting the losses are gains in the requirements for buttweld tubing, wire products and nails and temporary improvement in the production of tin plate.

Detroit Scrap Weak

DETROIT, March 4.—The market for old material in the district continues weak. No sales of large tonnage are reported.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$12.00 to $12.50
Borings and short turnings	8.50 to 9.00
Long turnings	7.50 to 8.00
No. 1 machinery cast	11.00 to 11.50
Automotive cast	13.00 to 13.50
Hydraul. comp. sheets	11.50 to 12.00
Stove plate	9.00 to 9.50
New No. 1 busheling	11.00 to 11.50
Old No. 1 busheling	8.75 to 9.25
Sheet clippings	9.00 to 9.50
Flashings	11.00 to 11.50

Boston

Pig Iron Sales Total 12,000 Tons—Expansion Also in Cast Iron Pipe Demand—Scrap Unsettled

BOSTON, March 4.—Pig iron sales reported the past week totaled 12,000 tons, contrasted with not more than 3000 tons the previous week. A Massachusetts valve manufacturer is credited with having purchased 2000 tons, a Massachusetts textile machinery maker 2000 tons, three other companies 1000 tons each, and the Rhode Island Malleable Iron Co. 500 tons of malleable. Four 1000-ton lots were placed with the Mystic Iron Works and one of that size with a Buffalo stack. Purchases otherwise were divided among Buffalo, New York State and Virginia stacks and the Mystic Iron Works. A Massachusetts heater maker has temporarily postponed buying 5000 to 6000 tons. The Universal Winding Co., Providence, R. I., has still to cover on 1000 tons.

Increased buying is not based on current or contemplated increases in the melt, but on the belief that iron is cheap today.

Foundry iron prices per gross ton deliv'd to most New England points:

†Buffalo, sil. 1.75 to 2.25	$20.28 to $20.78
†Buffalo, sil. 2.25 to 2.75	20.78 to 21.28
*Buffalo, sil. 1.75 to 2.25	20.91 to 21.41
*Buffalo, sil. 2.25 to 2.75	21.41 to 21.91
Va., sil. 1.75 to 2.25	25.21
Va., sil. 2.25 to 2.75	25.71
*Ala., sil. 1.75 to 2.25	22.61
*Ala., sil. 2.25 to 2.75	23.11
†Ala., sil. 1.75 to 2.25	18.75
†Ala., sil. 2.25 to 2.75	19.25

Freight rates: $4.91 all rail and $4.28 rail and water from Buffalo; $5.21 all rail from Virginia; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.
*All rail rate.
†Rail and water rate.

Cast Iron Pipe.—Greater activity is noted in the cast iron pipe market and prices appear firmer, largely in anticipation of higher freight rates into New England on and after March 20.

R. D. Wood & Co. was the low bidder on 1400 tons of 24-in. and 60 tons of 6.-in. required by Brockton, Mass., but no award has been made. Pittsfield, Mass., has purchased its 1930 requirements, about 1000 tons, from the Warren Foundry & Pipe Co. That foundry has sold 350 tons of 6 to 12-in. pipe to Quincy, Mass., and will furnish 100 tons for a State project at Waltham, Mass. Concord, N. H., has placed 250 tons of 6 to 12-in. pipe with the United States Pipe & Foundry Co. Falmouth, Mass., is taking bids on 100 tons of 6-in. stock, and Bedford, Mass., will shortly be in the market for similar pipe.

Prices on domestic pipe are: 4-in., $46.10 a ton, delivered common Boston freight rate points; 6-in. and larger, $42.10 to $43.10. A $4 differential is asked on Class A and gas pipe.

Reinforcing Steel.—Billet bar prospects appear brighter, but sales are slow in developing. Sales the past week fell short of 300 tons, not including 275 tons for a Bangor, Me., telephone building for which only an oral order has been issued. More than 1200 tons may be closed this week. One factor in holding up sales is the uncertainty of prices.

Open prices from stock are: 1 to 5-ton lots, 3.16½c. to 3.26½c. a lb., base, f.o.b. metropolitan Boston; 5 to 99 tons, 2.86½c.; 100 tons or more, 2.76½c., but most all sellers are shading these. Prices for rail steel bars also are unsettled, although 2.26½c. a lb., base, delivered Boston freight rate points, is still openly quoted.

Old Material.—With a noticeable letdown in business has come a wide range of prices offered for certain grades of scrap. For car lots of No. 1 heavy melting steel for Pittsburgh delivery, $10.30 a ton, on cars shipping point, is being paid; for west of Pittsburgh delivery, $10.75 to $11, and for eastern Pennsylvania delivery, $10.60. As high as $6.85 to $7 is being paid for steel turnings for New York State delivery, while prices paid for Pennsylvania delivery go as low as $6.25.

The market for shafting, Portland, Me., delivery, is $15 to $15.50 a ton on cars shipping point, and for Pennsylvania delivery not more than $14.50. Long bundled skeleton for Worcester, Mass., delivery is moving at $9 and $9.10 a ton shipping point, while for Pennsylvania delivery $9.50 is the prevailing price. In contrast with these wide price swings, the market for specification pipe has shrunk from $9 to $9.50 a ton, shipping point, to $9 to $9.10.

A steamer cleared here last week with 4000 tons of scrap, including some rails, for Savona, Italy, originally intended for Danzig.

Bids will shortly be taken for dismantling the South Station, Boston, train sheds, involving approximately 2000 tons of scrap.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$10.30 to $11.00
Scrap T rails	10.00 to 10.25
Scrap girder rails	9.25 to 9.50
No. 1 railroad wrought	10.50 to 11.00
Machine shop turnings	6.25 to 7.00
Cast iron borings (steel works and rolling mill)	6.25 to 6.60
Bundled skeleton, long	9.00 to 9.50
Forge flashings	9.00 to 9.25
Blast furnace borings and turnings	5.50 to 6.00
Forge scrap	8.50 to 9.00
Shafting	14.50 to 15.50
Steel car axles	16.00 to 17.00
Wrought pipe 1 in. in diameter (over 2 ft. long)	9.00 to 9.10
Rails for rolling	11.50 to 12.00
Cast iron borings, chemical	8.50 to 9.00

Prices per gross ton deliv'd consumers' yards:

Textile cast	$13.00 to $14.00
No. 1 machinery cast	15.00 to 15.25
No. 2 machinery cast	14.00 to 14.50
Stove plate	11.00 to 11.50
Railroad malleable	16.50 to 17.00

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex.	*3.55c. to 5.55c.
Squares and flats	*4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.
	Per Cent Off List
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

Canada

Montreal Terminal to Take Large Structural Tonnage

TORONTO, ONT., March 4. — Since lower prices were announced a couple of weeks ago, buying movement in pig iron has gathered strength. Business closed in February showed improvement over that of the preceding month. Inquiry is now coming out for second quarter delivery, but little actual contracting has been done. Pig iron prices are firm but unchanged.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	22.50
Imported Iron, Montreal Warehouse	
Summerlee	$33.50
Carron	33.00

Structural Steel.—The demand for structural steel in Canada is believed to be due for considerable expansion. The starting of work soon on the new Canadian National terminal at Montreal is expected. Following approval by the City Council of plans for elevated tracks, it is understood that bids for the structural steel work will be asked for within a few weeks. The structural steel tonnage will, it is said, be the largest ever used on a single job in Canada. Preliminary estimates place the amount at upward of 50,000 tons.

Old Material.—Reflecting the improvement in other lines of the iron

and steel industry, the market for scrap is becoming more active. Prices are unchanged.

Dealers' buying prices:

	Per Gross Ton	
	Toronto	Montreal
Heavy melting steel	$9.00	$8.00
Rails, scrap	11.00	9.00
No. 1 wrought	9.00	11.00
Machine shop turnings	7.00	6.00
Boiler plate	7.00	6.50
Heavy axle turnings	7.50	6.50
Cast borings	6.50	5.00
Steel borings	6.50	6.00
Wrought pipe	6.00	6.00
Steel axles	14.00	17.00
Axles, wrought iron	16.00	19.00
No. 1 machinery cast	....	16.00
Stove plate	....	12.00
Standard carwheels	....	14.50
Malleable	....	13.00
	Per Net Ton	
No. 1 mach'ry cast	$15.00	....
Stove plate	11.00	....
Standard carwheels	14.00	....
Malleable scrap	11.00	....

Mail Contracts Call for More Shipbuilding

WASHINGTON, March 4. — Four awards involving the construction of 66,000 gross tons of ships, at a total cost of nearly $30,000,000, and the rebuilding or reconditioning of ships at an additional cost of $10,000,000, were made on Feb. 25 by Postmaster General Brown when mail contracts were assigned to the Colombian Steamship Co., the Panama Mail Steamship Co. and the United States Lines under the Jones-White act. Assistant Postmaster General W. Irving Glover said that he expects to be able, in a few days, to recommend to Postmaster General Brown additional contracts, calling for further new building to the extent of at least 125,000 tons.

For March-April, tonnage rates paid sheet and tin mill workers in Midwestern mills subscribing to the sliding scale wage agreement of the Amalgamated Association of Iron, Steel and Tin Workers, continue unchanged, as compared with January-February. The boiling rate of puddlers is cut 25c. a ton, from $11.80 to $11.55.

Bethlehem Steel Corporation distributed $1,008,465 last year in benefits to disabled employees and dependents of deceased employees.

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.30c.
New billet reinforc. bars	3.15c.
Rail steel reinforc. bars	3.00c.
Hoops	4.05c.
Bands	3.50c.
Cold-fin. rounds and hex	3.85c.
Squares	4.35c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg	2.85
Cement c't'd nails, base 100 lb. keg	2.85
Chain, per 100 lb.	10.25
	Net per 100 Ft.
Lap-welded steel boiler tubes, 2-in.	$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in.	17.50
4-in.	36.00

Cincinnati

Pig Iron Buyers Cautious as Melt Declines—Further Slackening in Demand for Sheet Steel

CINCINNATI, March 4.—With the melt lighter than two months ago and district consumers of pig iron declining to anticipate their needs for more than a month, the demand for pig iron in this district receded sharply last week. Sales reported totaled only about 2600 tons, as against 8500 tons the preceding week.

The continued weakness of Southern prices, as contrasted with the relative firmness of Northern quotations, is disturbing the market noticeably, causing buyers to be wary lest the Southern instability affect Northern iron and catch consumers with stocks of high-priced material.

Two northern Ohio buyers took 200 tons and 50 tons of silvery each at full prices. Another northern Ohio consumer bought 300 tons of Southern foundry iron, and a southern Indiana buyer took 300 tons.

Only two requests for quotations are before the trade. One is from central Indiana for 500 to 1000 tons of Northern foundry iron and the other from northern Indiana for 1000 tons.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$19.39 to $20.39
Ala. fdy., sil. 1.75 to 2.25	16.69 to 17.69
Ala. fdy., sil. 2.25 to 2.75	17.19 to 18.19
Tenn. fdy., sil. 1.75 to 2.25	17.19 to 17.69
S'th'n Ohio silvery, 8 per cent	26.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Finished Material.—For a second time within the past month, demand for sheets has lagged behind production. Fresh bookings were on a par with those of the preceding week, having been equal to about 50 per cent of capacity, but production schedules were continued at 75 per cent. Schedules for this week call for operations at 60 to 65 per cent, with mills depending entirely upon current bookings. With the curtailment of automotive specifications, the cold-rolled strip units of the leading interest in this district have also slackened.

Coke.—With the melt easing, specifications for foundry grades of coke slackened slightly last week. Prices continue firm.

Old Material.—The slackening of mill operations in this district has brought a reduction in the scrap shipments against contracts. New business is also easing off. This undertone of weakness caused dealers to bid 25c. less on heavy melting steel and No. 2 wrought than in the preceding week.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$12.25 to $12.75
Scrap rails for melting	13.25 to 13.75
Loose sheet clippings	8.00 to 8.50
Bundled sheets	10.75 to 11.25
Cast iron borings	9.00 to 9.50
Machine shop turnings	8.25 to 8.75
No. 1 busheling	10.00 to 10.50
No. 2 busheling	6.50 to 7.00
Rails for rolling	13.50 to 14.00
No. 1 locomotive tires	14.25 to 14.75
No. 2 railroad wrought	12.50 to 13.00
Short rails	17.75 to 18.25
Cast iron carwheels	12.00 to 12.50
No. 1 machinery cast	18.50 to 19.00
No. 1 railroad cast	15.00 to 15.50
Burnt cast	10.00 to 10.50
Stove plate	10.00 to 10.50
Brake shoes	10.00 to 10.50
Agricultural malleable	14.00 to 14.50
Railroad malleable	16.00 to 15.50

Buffalo

Pig Iron Sales Total 8000 Tons, Mostly in Small Lots—Steel Operations Unchanged

BUFFALO, March 4.—Bookings of pig iron in the past week in this territory totaled about 8000 tons. Most of the orders were small; one lot from the East amounted to 500 tons of foundry, and there were two or three of 300 tons, and one of 400 tons. Among current inquiries is one from New England for 2000 tons of foundry and another for 1000 tons. The melt in this district remains about the same. Radiator plants are operating at 50 to 60 per cent.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$18.50
No. 2X fdy., sil. 2.25 to 2.75	19.00
No. 1 fdy., sil. 2.75 to 3.25	20.00
Malleable, sil. up to 2.25	19.00
Basic	17.00
Lake Superior charcoal	27.28

Finished Steel.—Operations of Buffalo steel mills remain at about the same rate as in recent weeks. The Lackawanna plant of the Bethlehem Steel Co. is operating 21 of its 24 open hearths; Donner Steel Co. is operating 4 or 5 of 9; Wickwire-Spencer, Buffalo Bolt Co. and Gould Coupler Co. are at about the same rate of operation as a week ago. Sheet mill operations have increased, with the Seneca Iron & Steel Co. operating 85 to 90 per cent. New sheet business, how-

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Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.95c.
Cold-fin. flats, sq. and hex	4.45c.
Rounds	3.95c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$3.20
Black wire, base per 100 lb.	3.45

ever, shows a slight slackening. Among inquiries for reinforcing bars is one of 100 tons for the State Hospital at Newark, N. Y. Fabricated structural business is slow.

Old Material.—A mill that recently purchased No. 1 heavy melting steel at $14 is reported to have again purchased at $14 and also at $14.50. The market is sentimentally a little weaker, particularly on No. 2 steel in view of the situation at Weirton, W. Va., where rejections have caused a backing up of this material in this territory. No. 2 steel is being quoted now at $14, Weirton, and is more plentiful in this territory than it has been in some time.

Prices per gross ton f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$14.50 to $15.50
No. 2 heavy melting scrap	12.50
Scrap rails	14.75 to 15.25
Hydraul. comp. sheets	12.50
Hand bundled sheets	10.50 to 11.00
Drop forge flashings	12.50
No. 1 busheling	13.00 to 13.75
Hvy. steel axle turnings	13.50 to 14.00
Machine shop turnings	9.50 to 10.00
No. 1 railroad wrought	11.00 to 11.50
Acid Open-Hearth Grades:	
Knuckles and couplers	18.00 to 19.00
Coil and leaf springs	18.00 to 19.00
Rolled steel wheels	18.00 to 18.50
Low phos. billet and bloom ends	18.00 to 19.00
Electric Furnace Grades:	
Short shov. steel turnings	12.50 to 13.00
Blast Furnace Grades:	
Short mixed borings and turnings	11.00 to 11.50
Cast iron borings	11.00 to 11.50
No. 2 busheling	8.00
Rolling Mill Grades:	
Steel car axles	17.00 to 17.50
Iron axles	20.00 to 21.00
Cupola Grades:	
No. 1 machinery cast	14.50 to 15.00
Stove plate	12.75 to 13.00
Locomotive grate bars	10.50 to 11.00
Steel rails, 3 ft. and under	17.50 to 18.00
Cast iron carwheels	12.00 to 12.50
Malleable Grades:	
Industrial	16.50 to 17.00
Railroad	16.50 to 17.00
Agricultural	16.50 to 17.00
Special Grades:	
Chemical borings	12.00 to 12.50

Fabricated Structural Steel

STRUCTURAL steel awards are not reflecting any marked uptrend in plans for spring building construction. The total for the past week was a little below 32,000 tons, while new projects that came out for bids totaled only 26,000 tons. The largest award was 7000 tons for grade separation work in Chicago and the next largest was 4000 tons for a building at Broadway and Thirty-ninth Street, New York.

New projects included about 4500 tons for a building in Detroit for the Michigan Bell Telephone Co., 4000 tons for an addition to the Northwestern Mutual Life Building, Milwaukee, and 2500 tons for a vehicular roadway on Manhattan Bridge, New York. Awards follow:

BINGHAM, ME., 250 tons, Central Maine Power Co., to F. D. Lyons Iron Works, local fabricator.

BOSTON, 1500 tons, newspaper plant, to New England Structural Co.

GOFFS FALLS, N. H., 1500 tons, Boston & Maine bridge, to Phoenix Bridge Co.

NEW YORK, 4000 tons, loft building, Broadway and Thirty-ninth Street, to Harris Structural Steel Co.

NEW YORK, 2000 tons, Home for Incurables, Third Avenue and 183rd Street, to Levering & Garrigues Co.

YONKERS, N. Y., 300 tons, building for Boyce-Thompson Institute, to Montgomery Iron & Steel Co.

YONKERS, 300 tons, sewage disposal plant, to Just Structural Engineering Co.

TUCKAHOE, N. Y., 230 tons, high school, to Just Structural Engineering Co.

CAMDEN, N. J., 600 tons, building for Victor Talking Machine Co., to Bethlehem Fabricators, Inc.

NEW YORK CENTRAL RAILROAD, 300 tons, bridge at Athol Springs, N. Y., to McClintic-Marshall Co.

BAYONNE, N. J., 100 tons, building for Tide Water Oil Co., to McClintic-Marshall Co.

TRENTON, N. J., 1135 tons, addition for John A. Roebling's Sons Co., to McClintic-Marshall Co.

PENNSYLVANIA RAILROAD, 500 tons, Powelton Avenue tunnel in Philadelphia, to American Bridge Co.

PENNSYLVANIA RAILROAD, 3000 tons, bridge at Oil City, Pa., to McClintic-Marshall Co.

WASHINGTON, 600 tons, dormitory at Georgetown University, to American Bridge Co.

NEW ORLEANS, 160 tons, for flood gates, to Ingalls Iron Works.

TEXAS & PACIFIC RAILROAD, 2600 tons, bridge over Trinity River at Dallas, Tex., to McClintic-Marshall Co.

NIAGARA FALLS, N. Y., 100 tons, mill building, to Pittsburgh Bridge & Iron Co.

BEAVER FALLS, PA., 185 tons, Masonic Hall, to Pittsburgh Bridge & Iron Co.

LEESPORT, PA., 125 tons, bridge, to McClintic-Marshall Co.

MILWAUKEE, 550 tons, building for Milwaukee Electric Railway & Light Co., to Worden-Allen Co.

JANESVILLE, WIS., 125 tons, addition for Parker Pen Co., to R. C. Mahon Co., Detroit.

CHICAGO, 100 tons, building for Nahigian Brothers, to Wendnagel & Co.

CHICAGO, 7000 tons, grade crossing elimination work for railroads entering Union Station, to American Bridge Co.

CHICAGO, 1000 tons, Volta school building, to an unnamed bidder.

CHICAGO, 150 tons, La Salle Street substation for Commonwealth Edison Co., to McClintic-Marshall Co.

CHICAGO, 200 tons, American Can Co. building, to Mississippi Valley Structural Steel Co.

PEORIA, ILL., 170 tons, bank building, to Mississippi Valley Structural Steel Co.

OMAHA, NEB., 450 tons, Union Station, to Omaha Structural Steel Co.; this is in addition to tonnage previously reported.

DENVER, 700 tons, Custom House, to McClintic-Marshall Co.

BERKELEY, CAL., 270 tons, library, to Pacific Coast Engineering Co.

OAKLAND, 100 tons, warehouse, Fourth Avenue and East Fourteenth Street, to Judson-Pacific Co.

SAN FRANCISCO, 950 tons, plates, two 134,000 and two 93,000-bbl. tanks, shells only, for Standard Oil Co. at San Luis Obispo, to Western Pipe & Steel Co.

SAN FRANCISCO, 120 tons, apartment building on Ellis Street, to Golden Gate Iron Works.

SAN FRANCISCO, 130 tons, apartment building, Hays and Pierce Streets, to McClintic-Marshall Co.

SAN FRANCISCO, 120 tons, power house at Tiger Creek for Pacific Gas & Electric Co., to Herrick Iron Works.

SAN FRANCISCO, 130 tons, power house at Salt Creek for Pacific Gas & Electric Co., to Herrick Iron Works.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

NEW YORK, 400 tons, school No. 198 in Queens.

NEW YORK, 1400 tons, school No. 98, Boston Road and 173rd Street.

NEW YORK, 2500 tons, plates and shapes for vehicular roadway on Manhattan Bridge; bids opened by Department of Plant and Structures March 10.

BROOKLYN, 7700 tons, section 4, route 110, subway; low bidder on general contract, Goldberger-Raabin, Inc., on structural steel, American Bridge Co.

BROOKLYN, unstated tonnage, First Church of Christ Scientist.

MOUNT VERNON, N. Y., 200 tons, addition to Mount Vernon Hospital.

CINCINNATI, 1100 tons, additional part of Cincinnati Union Terminal project. Mount Vernon Bridge Co., low bidder.

PENNHURST, PA., 600 tons, State buildings; Bauman Iron Works, Reading, Pa., low bidder for erection.

SCRANTON, PA., 1500 tons, Post Office and Court House.

NEW YORK CENTRAL RAILROAD, 700 tons, grade crossing elimination; Depew, N. Y., 300 tons and East 144th Street, New York, 400 tons.

BALTIMORE & OHIO RAILROAD, 435 tons, bridge at Columbus, Ohio.

LEHIGH VALLEY RAILROAD, 100 tons, bridge No. 3 in Jersey City, N. J.

PHILADELPHIA, 1400 tons, underground concourse at City Hall.

DETROIT, 4500 tons, main building for Michigan Bell Telephone Co.

DETROIT, 1800 tons, branch office exchanges for Michigan Bell Telephone Co. in Bay City, Lansing, Kalamazoo and Detroit.

DETROIT, 300 tons, Y. W. C. A. Building.

CONNELLSVILLE, PA., 300 tons, building for Capstan Paper Mills.

PERE MARQUETTE, tonnage not stated, bascule bridge at Port Huron, Mich.

AKRON, OHIO, 2000 tons, Y. M. C. A. Building.

MILWAUKEE, 4000 tons, addition to Northwestern Mutual Life Building; bids close March 17.

MILWAUKEE, 360 tons, armory.

MANTENO, ILL., 500 tons, State buildings; J. B. French & Co., low bidders on general contract.

TACOMA, WASH., 1175 tons, plates, 44-in. welded steel pipe; bids opened.

EVERETT, WASH., 200 tons, bridge over Sank River; general contract awarded to General Construction Co.

OAKLAND, 368 tons, plates, 20 and 24-in. welded steel pipe; Steel Tank & Pipe Co., low bidder.

SAN FRANCISCO, 1400 tons, hospital at Presidio; general contract awarded to Clinton Construction Co.

SAN FRANCISCO, 230 tons, addition to State building; general contract awarded to Vogt & Davidson.

SACRAMENTO, 145 tons, live stock building; bids opened.

Non-Ferrous Metal Markets

Copper Quiet and Unchanged —New Low for Tin—Lead Reduced Twice—Zinc Weak

NEW YORK, March 4.

Copper.—For the first few days of March demand for copper is reported a little better than in February, and February as a whole was better than January. Demand is, however, by no means satisfactory. Foreign sales thus far this month have been about 3000 tons and domestic demand has been fairly good. Comparing February with January, producers say that total foreign sales, at about 33,000 tons, were larger in proportion for the shorter month than the January sales. In sales for domestic account the February total was about 1000 tons larger than for January, which is considered a gain in that the actual number of business days in February was 22, against 26 in January. Statistics for February will be out about March 12 and, while they are expected to show an increase in stocks, this will probably be smaller than the 32,000 tons in January. There is still no indication of a change in prices. Electrolytic copper is quoted at 18c., delivered in the Connecticut Valley, with the price for export unchanged at 18.30c., c.i.f. usual European ports. Lake copper is moderately active and firm at 18c. to 18.12½c., delivered.

Copper Averages.—The average price of Lake copper for February, based on daily quotations in THE IRON AGE, was 18.12½c., delivered New York. The price of electrolytic copper was 17.75c., refinery, or 18c., delivered in the Connecticut Valley.

Tin.—Spot Straits tin was quoted today at a new low for many months —37c., New York. This is the lowest level since Dec. 6, 1922, when the same price prevailed. The cause is not difficult to determine. Statistics for February show an increase in the world's visible supply for that month of 4549 tons, which is probably a record for any one month. This brings the total visible supply to 33,591 tons, also the largest in many months. Shipments from the Straits in February were very heavy, at 9361 tons. The inevitable result is too much tin. This, combined with falling prices of silver and agricultural commodities, has caused consumers to be exceedingly slow in entering the market. Sales of Straits tin for the week were very light, and today the market was exceedingly dull. New low levels were reached today in prices at London, with spot standard quoted at £166

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	March 4	March 3	March 1	Feb. 28	Feb. 27	Feb. 26
Lake copper, New York	18.12½	18.12½	18.12½	18.12½	18.12½	18.12½
Electrolytic copper, N. Y.*	17.75	17.75	17.75	17.75	17.75	17.75
Straits tin, spot, N. Y.	37.00	37.37½	....	37.50	37.95	38.25
Zinc, East St. Louis	5.10	5.10	5.10	5.10	5.10	5.15
Zinc, New York	5.45	5.45	5.45	5.45	5.45	5.45
Lead, St. Louis	5.85	5.85	6.00	6.00	6.00	6.10
Lead, New York	6.00	6.00	6.15	6.15	6.15	6.25

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Rolled Products

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets—
- High brass ..... 23.25c.
- Copper, hot rolled ..... 26.75c.
- Zinc ..... 10.50c.
- Lead (full sheets) ..... 9.75c.

Seamless Tubes—
- High brass ..... 28.25c.
- Copper ..... 29.25c.

Rods—
- High brass ..... 21.25c.
- Naval brass ..... 24.00c.

Wire—
- Copper ..... 19.87½c.
- High brass ..... 23.75c.

Copper in Rolls ..... 26.75c.
Brazed Brass Tubing ..... 30.87½c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

- Sheets, 0 to 10 gage, 3 to 30 in. wide ..... 33.00c.
- Tubes, base ..... 42.00c.
- Machine rods ..... 34.00c.

Chicago Warehouse

(Prices Cover Trucking to Customers' Doors in City Limits)

Sheets—	Base per Lb.
High brass	23.25c.
Copper, hot rolled	27.75c.
Copper, cold rolled, 14 oz. and heavier	30.00c.
Zinc	10.75c.
Lead, wide	10.30c.
Seamless Tubes—	
Brass	28.25c.
Copper	29.25c.
Brass Rods	21.25c.
Brazed Brass Tubes	31.00c.

New York or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	21.12½c.	to 22.12½c.
Copper, hot rolled, base sizes	27.75c.	to 28.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes	30.00c.	to 31.00c.
Seamless Tubes—		
Brass	26.00c.	to 27.00c.
Copper	29.12½c.	to 30.12½c.
Brass Rods	18.87½c.	to 19.87½c.
Brazed Brass Tubes	29.12½c.	to 30.12½c.

New York Warehouse

Delivered Prices, Base per Lb.

Zinc sheets (No. 9), casks	10.75c.	to 11.25c.
Zinc sheets, open	11.50c.	to 12.00c.

Metals from New York Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	39.50c.	to 40.50c.
Tin, bar	41.50c.	to 42.50c.
Copper, Lake	19.50c.	
Copper, electrolytic	19.25c.	
Copper, casting	19.00c.	
Zinc, slab	6.50c.	to 7.50c.
Lead, American pig	7.00c.	to 7.50c.
Lead, bar	9.00c.	to 9.50c.
Antimony, Asiatic	11.00c.	to 11.50c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	25.00c.	to 26.00c.
Alum. ingots, No. 12 alloy	24.00c.	to 25.00c.
Babbitt metal, commercial grade	25.00c.	to 35.00c.
Solder, ½ and ½	26.50c.	to 27.50c.

Metals from Cleveland Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	43.38c.	
Tin, bar	45.38c.	
Copper, Lake	19.50c.	
Copper, electrolytic	19.25c.	
Copper, casting	18.75c.	
Zinc, slab	7.75c.	to 8.00c.
Lead, American pig	6.85c.	to 7.10c.
Lead, bar	9.25c.	
Antimony, Asiatic	16.00c.	
Babbitt metal, medium grade	18.00c.	
Babbitt metal, high grade	46.50c.	
Solder, ½ and ½	28.25c.	

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	14.75c.	16.25c.
Copper, hvy. and wire	14.50c.	16.00c.
Copper, light and bottoms	12.50c.	14.00c.
Brass, heavy	8.00c.	9.25c.
Brass, light	6.75c.	7.75c.
Hvy. machine composition	11.25c.	12.25c.
No. 1 yel. brass turnings	9.00c.	9.50c.
No. 1 red brass or compos. turnings	10.50c.	11.75c.
Lead, heavy	4.50c.	5.00c.
Lead, tea	3.75c.	4.25c.
Zinc	2.75c.	3.25c.
Sheet aluminum	10.50c.	12.50c.
Cast aluminum	10.00c.	12.00c.

10s., future standard at £169 and spot Straits at £168 15s., all about £4 per ton less than a week ago. The Singapore price today was £172 2s. 6d.

Lead.—The American Smelting & Refining Co. in the last week has twice reduced its quotation. On Thursday, Feb. 27, it reduced its contract price from 6.25c. to 6.10c., New York, and yesterday another reduction was made to 6c., New York. The corresponding price in the outside market is now 5.85c., St. Louis. Lower prices in London and increased production, resulting in larger stocks, are the causes. Buying lately has been light.

Zinc.—Demand for prime Western zinc is small and the market is weak at 5.10c., East St. Louis, or 5.45c., New York. The expected stiffening in prices, due to the ore situation, has not materialized. The ore surplus was further reduced last week and is now down to 9266 tons, the smallest in many years. Shipments last week were large, at 12,231 tons, against an output which is estimated at about 8800 tons. The price was unchanged at $37, Joplin, the expected advance to $40 not having materialized. There is a slight premium for prime Western zinc for May delivery.

Antimony.—For spot and March, Chinese metal is unchanged at 9c., New York, duty paid. Owing to the uncertainty as to a higher duty, futures are quoted at 6c., duty disregarded. The Chinese market is firmer, due to the report that the government may place an embargo on silver, which would have an effect upon exchange.

Nickel.—Wholesale lots of ingot nickel are quoted at 35c. a lb., with shot nickel at 36c. and electrolytic nickel in cathodes at 35c.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is obtainable at 23.90c. a lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, March 4.—Prices in this market are lower with the exception of copper and antimony and buying is quiet. It is reported that supplies of old metals are diminishing.

Prices per lb., in carload lots: Lake copper, 18.50c.; tin, 38.25c.; lead, 5.95c.; zinc, 5.25c.; in less-than-carload lots, antimony, 9.87½c. On old metals we quote copper wire, crucible shapes and copper clips, 14c.; copper bottoms, 11.50c.; red brass, 11.50c.; yellow brass, 8c.; lead pipe, 4.25c.; zinc, 3c.; pewter, No. 1, 20c.; tin foil, 22c.; block tin, 32c.; aluminum, 12.87½c.; all being dealers' prices for less-than-carload lots.

Proxy Fight for Gulf States Control

Republic Interests Oppose Effort to Amend By-Laws to Require Two-Thirds Approval of Sale

AFFAIRS of the Gulf States Steel Co., Birmingham, came sharply into the limelight in the past few days with the announcement that the American Rolling Mill Co. had withdrawn its offer to purchase, the calling of a special meeting of stockholders for March 25 to amend the by-laws so that no merger or sale can be effected without a two-thirds approval, and the formation of a stockholders' proxy committee representing interests affiliated with the new Republic Steel Corporation to oppose the passing of such an amendment. It will also be the effort of this stockholders' committee to elect new directors who will represent the Republic group.

Armco Discontinues Negotiations

On behalf of the American Rolling Mill Co., Calvin Verity, vice-president, issued the following statement:

"It has been mutually agreed that further discussions between Armco and Gulf States Steel be discontinued. This does not in any way change the friendly relations between the two companies. They will continue to work together as they have in the past."

A few days before the above statement was issued, W. H. Coverdale, president of the Gulf States company, had called a special meeting of stockholders for March 25, which is also the date on which the annual meeting of the board of directors will be held.

In this letter, President Coverdale stated that "a situation might arise where a sale, lease or exchange of all the assets of the company might be voted by the holders of 51 per cent of the stock which might not be for the best interests of the remaining 49 per cent."

Stockholders were asked to sign proxies favorable to this amendment. The adoption of the amendment, it was stated, requires the vote of the holders of a majority of the outstanding stock.

To prevent the adoption of this amendment, the Republic Steel interests have named a stockholders' proxy committee consisting of G. Munro Hubbard of J. G. White & Co., New York; Robert I. Ingalls, president, Ingalls Iron Works Co., Birmingham, and S. Livingston Mather, Cleveland. Mr. Mather is closely affiliated with Otis & Co., the Cleveland banking house which brought about the Republic Steel merger.

Say Merger Should Be Facilitated

In a letter to stockholders of the Gulf States company, this proxy committee says:

"While it is not the purpose of the committee to use any proxies intrusted to it to vote for any combination, merger or sale, this committee believes that the best interests of the company and its stockholders and of the community in which its plants are located lie in the eventual inclusion of this company as a part of a larger combination rather than its continuance as a relatively small unit in the steel industry.

"We believe that if such a combination can be effected on favorable terms it should be facilitated rather than obstructed, and that an amendment to the certificate of incorporation which puts it in the power of a relatively small group to block a sale on fair terms desired by the majority of their fellow stockholders should be rejected.

"The directors to be selected by this committee will give careful consideration to any proposal for the combination of this company with other units which they deem in the best interests of all the stockholders, but no proposal will be finally accepted until it has been submitted to the stockholders for approval."

Reinforcing Steel

Awards Light at 3300 Tons—Inquiries 3000 Tons

LETTINGS of reinforcing steel reported the past week totaled about 3300 tons, of which 1450 tons is for a power plant in Missouri. New projects, at 3000 tons, include 1000 tons for a filtration plant at Erie, Pa. Awards follow:

PHILADELPHIA, 190 tons, first section of concourse under City Hall, to Concrete Steel Co.

WADSWORTH, OHIO, 350 tons, building for Ohio Injector Co., to Jones & Laughlin Steel Corporation.

CINCINNATI, 211 tons, Jewish Hospital building, to Pollak Steel Co.

MOLINE, ILL., 250 tons, high school, to Concrete Steel Co.

CHAMPAIGN, ILL., 243 tons, chemistry building for University of Illinois, to Hugh Baker & Co.

BAGNELL, MO., 1450 tons, power plant for Union Electric Light & Power Co., to Laclede Steel Co.

SAN FRANCISCO, 110 tons, two warehouses for Government at Goat Island, to Pacific Coast Steel Corporation.

BERKELEY, CAL., 135 tons, library, to Concrete Engineering Co.

SAN RAFAEL, CAL., 105 tons, school, to Concrete Engineering Co.

SANTA CLARA, CAL., 175 tons, dormitory for University of Santa Clara, to W. S. Wetenhall Co.

SALINAS, CAL., 100 tons, bank, to W. S. Wetenhall Co.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

PHILADELPHIA, 700 tons, public school at Thirty-third and Tasker Streets.

PHILADELPHIA, 400 tons, second section of concourse under City Hall.

ERIE, PA., 1000 tons, filtration plant; general contract awarded.

NEWARK, N. Y., 100 tons, staff and employees' quarters at State Hospital; general contract awarded to Felton Construction Co.

DAYTON, OHIO, 200 tons, telephone building.

AKRON, OHIO, 200 tons, Mayflower Hotel.

SEATTLE, 212 tons, East approach to West Spokane Street bridge; bids March 7.

SAN FRANCISCO, 350 tons, hospital at Presidio for Government.

PERSONAL

GEORGE GORDON CRAWFORD, recently elected president of the Jones & Laughlin Steel Corporation, Pittsburgh, was the guest of honor at a banquet held on Feb. 25 at the Duquesne Club, Pittsburgh, by officials of the Jones & Laughlin company and Pittsburgh business men. GEORGE M. LAUGHLIN, JR., chairman of the board

G. G. CRAWFORD

of the Jones & Laughlin company, presided at the dinner, and WILLIS L. KING, vice-president, made the principal address. Other speakers were H. B. RUST, president of the Koppers Co., TAYLOR ALLDERDICE, formerly president of the National Tube Co., and B. F. JONES, III, vice-president and secretary of the Jones & Laughlin company.

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RANDALL VAN WINKLE has been made manager of the Wandtke Pattern & Foundry Co., Anderson, Ind. He was at one time connected with the Anderson Foundry & Machine Works.

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HUBERT WHITE, for several years manager of the Mansfield Foundry Co., Mansfield, Mass., has resigned and is spending the winter in the West Indies. Mr. White formerly was associated with E. Arthur Tutein & Co., Boston.

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GIUSEPPE FACCIOLI, associate manager and works engineer, has just completed 25 years of association with the Pittsfield, Mass., works of the General Electric Co. He was born in Rome in 1877, was graduated from the Institute of Technology, Milan, came to this country when 25 years of age.

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BENJAMIN S. LIVINGSTON and HERBERT W. SOUTHARD, of the Far Eastern department of the Foreign Traders Co., New York, which is being liquidated, have organized Livingston & Southard, Inc., 17 Battery Place, New York, to engage in export and import of iron and steel and specialties.

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R. J. ALLEN has joined the staff of Worthington Pump & Machinery Corporation, to supervise metallurgical work in its Harrison, N. J., Holyoke, Mass., Buffalo, and Cincinnati plants. He was for 12 years metallurgist, Rolls-Royce of America, Inc., Springfield, Mass., and retains a consulting connection with his former associates.

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CHARLES F. FREDE, who has been with the Commonwealth division of the General Steel Castings Corporation since 1902, first as assistant chief engineer in charge of the drafting room and since 1918 manager of production, has been appointed works manager. HARRY E. ROGERS, superintendent of the finishing department since 1917, has been made his assistant. HARRY THIELE, heretofore superintendent of the pattern department, has been made superintendent of the core and foundry departments also. EARL F. VARNUM, who has been associated with the company for the past 20 years, has been appointed assistant to HARRISON HOBLITZELLE, vice-president and general manager, and GILBERT F. CLOSE, who has been assistant to the president, has become director of relations.

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MARTIN J. LUTHER, for a number of years Chicago manager for Kearney & Trecker Corporation, Milwaukee, has become special representative for

M. J. LUTHER

The Monarch Machine Tool Co. in the Chicago and Milwaukee territories. He will make his headquarters at the Chicago office of Manning, Maxwell & Moore, Inc., who are exclusive representatives in these territories for the Monarch company.

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GEORGE J. LYNCH has been appointed district manager of the new branch office at Tulsa, Okla., of the Chicago Pneumatic Tool Co., New York.

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J. MARVIN DOYLE, formerly vice-president of Colladay, Doyle & Co., has been made associate manager of the Brooklyn, N. Y., warehouse of C. S. Davis & Co., tin plate.

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HARRY B. LODER, for the past two years with the New York sales office of the Wrought Iron Co. of America, has been transferred to the general office at Lebanon, Pa., to represent the company in eastern Pennsylvania, formerly covered by GEORGE H. CLYMER, now district sales manager at Philadelphia.

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W. E. CHOLLAR has been appointed vice-president and general manager

W. E. CHOLLAR

of the Remington Cash Register Co., succeeding PAUL V. BUNN, who has resigned. Mr. Chollar has been connected with the Remington organization for 14 years. For the past several years he has held the position of general purchasing agent and recently was appointed vice-president of the Remington Arms Co.

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B. H. JOHNSON, of the Florence Pipe Foundry & Machine Co., Florence, N. J., was scheduled to address the Wisconsin Gray Iron Foundry Group, March 5, at the Schroeder Hotel, Milwaukee, on "The Physicology of Cast Iron."

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J. P. GILL, metallurgist, Vanadium Alloys Steel Co., Latrobe, Pa., on March 18 will address a joint meeting of the Tri-City sections of the American Society of Mechanical Engineers and of the American Society for Steel Treating. His subject will be "Rational Choice of Tool Steel."

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FRANKLIN FARREL, JR., formerly vice-president of the Farrel-Birmingham Co., Ansonia, Conn., has been made chairman of the board, and N. W. PICKERING has been elected president to succeed WALTER PERRY. D. R. BOWEN, chief engineer, CARL HITCHCOCK, formerly assistant secretary, FRANKLIN R. HOADLEY, manager of the foundry department and A. G. KESSLER, manager of the Buffalo division, have been elected vice-presidents.

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R. S. ARCHER, Aluminum Co. of America, will discuss "New Develop-

ments in Aluminum" at the March meeting of the Cincinnati chapter of the American Society for Steel Treating at the Hotel Alms, March 6. S. L. HOYT, of the General Electric Co., will deliver an address on Carboloy.

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WILLIAMS B. TODD, manager of sales in the cold finished department, Jones & Laughlin Steel Corporation, Pittsburgh, has been appointed assistant general manager of sales, and in his new capacity will have the company's automotive business as a

W. B. TODD

whole under his direction. Mr. Todd went with the Jones & Laughlin company in February, 1922, and has been in charge of the cold finished department since that time. He was previously vice-president of the Union Drawn Steel Co., Beaver Falls, Pa. J. DAVIS ALLEN, who has been assistant to Mr. Todd since 1922, succeeds him as manager of sales in the cold finished department. Mr. Allen became associated with the Jones & Laughlin company 27 years ago, and has been indentified with the cold finished department since 1909. Both these appointments were effective March 3.

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A. T. COLWELL has been appointed chief engineer of Thompson Products, Inc., Cleveland. He has been connected with the company since 1922, first in the sales department, later as eastern sales representative and from 1924 to 1927 as sales engineer in Detroit and since the latter year Michigan representative of the company. He graduated from West Point Military Academy in 1918 and served in the Engineering Corps of the army until 1922.

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SEYMOUR WHEELER, vice-president, Pickands, Brown & Co., Chicago, has been elected a director of the Interlake Iron Corporation, succeeding the late E. L. Whittemore.

OBITUARY

PERRIN GEORGE MARCH, founder and for years president of the Cincinnati Shaper Co. and one of the pioneers of the machine tool industry in Cincinnati, died at his home in Cincinnati on Feb. 26, aged 77 years. He was born in Lebanon, Ohio, and went to the Middle West metropolis when the machine tool industry was in its infancy. Early in his career, he displayed a marked interest in machinery and at the age of 29, in partnership with B. W. Flack, of Baltimore, purchased the Universal Radial Drill Co. Under his direction it became one of the early famous companies of the Cincinnati district. In 1894, however, the Universal Drill Co. was sold to the Bickford Drill Co. In 1898, he founded the Cincinnati Shaper Co., of which he remained president until the time of his death. Mr. March was one of the best informed men in the machine tool trade, not only in Cincinnati, but throughout the country. Not only was he interested in mechanical production, but in mechanical education as well. Accordingly, he helped organize and for a time was president of the Ohio Mechanics' Institute and held a position on the board of directors at the time of his death.

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OLIVER B. BARROWS, who had been connected with the American Steel & Wire Co. for more than 40 years, the last 30 years as St. Louis representative, died in that city following a heart attack, aged 63 years.

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CLEMENS HERSCHEL, inventor of the Venturi meter, died at his home in Glen Ridge, N. J., March 1. He was born in Boston on March 23, 1842, and was graduated from the Lawrence Scientific School of Harvard University in 1860. He then became hydraulic engineer for the Holyoke Water Power Co. In 1889 he engaged in developing the water supply for Newark, N. J., and is widely credited with doing much pioneer work in that connection. For his invention of the Venturi water meter, he was awarded the Elliott Cresson gold medal of the Franklin Institute of Philadelphia.

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ALEX LEVEDAHL, inventor and one of the founders of the Independent Pneumatic Tool Co., died Feb. 24 at his home at Aurora, Ill.

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H. D. HAMMOND, vice-president in charge of miscellaneous sales for the American Steel Foundries, died March 1 at Chicago. During his early days in the business world he spent four years with Robert Wetherill & Co., Chester, Pa., and a year with the Keystone Drop Forge Works, also at Chester. He entered the service of the American Steel Foundries in September, 1906, at the Thurlow, Pa., Works. In 1910 he was transferred to the Pittsburgh sales office. In 1913 he was made production manager at the Indiana Harbor works and in March, 1915, he was promoted to manager of railroad miscellaneous sales. He became general manager

HARRY D. HAMMOND

of miscellaneous sales in 1917 and in April, 1929, he was elected vice-president in charge of miscellaneous sales.

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E. J. LAVINO, chairman of the board, E. J. Lavino & Co., ferroalloys, Philadelphia, and also of the company's subsidiaries, died March 3, at his home in Philadelphia, aged 77 years. He was born in Smyrna, Turkey, Nov. 17, 1852, of Dutch parentage and was educated in Brussels, Belgium, returning to Smyrna to engage in business with his father, part owner of Keun, Lavino & Co., Smyrna, exporters of ores and growers and exporters of licorice roots and other eastern products. He came to the United States in 1877 and shortly after organized E. J. Lavino & Co. in partnership with his brother, Henry F. Lavino. Following the death of his brother, he continued the partnership with his son, E. George Lavino, until 1916, when the company was incorporated. Mr. Lavino had been chairman of the board for about three years, having retired as president because of ill health to be succeeded by his son, Edwin M. Lavino. He was also chairman of the board of the subsidiary companies, Lavino & Co., Inc., metals, Lavino-American & Asiatic Co., importer of rubber, Lavino (London), Ltd., Lavino Shipping Co., Lavino Refractories Co. and the Lavino Furnace Co.

Gain in Iron and Steel Exports

Decline in Rolled and Finished Shipments—Total Imports Were Lowest in Five Years—Much Scrap Exported

WASHINGTON, Feb. 27.—With the inclusion of steel tanks, a new item, in the amplified classification of iron and steel products arranged by the Iron and Steel Division, Department of Commerce, exports in January totaled 225,090 gross tons, as reported in THE IRON AGE of Feb. 27.

Since exportation of the new item, which covers complete oil, gas and water tanks, knocked down, was 1245 tons in January, this movement should be excluded if we are to make exact comparison with previous exports. On this basis the January gain would be 8603 tons over the December exports of 215,242 tons, rather than 9848 tons, the actual difference between totals in the January and December tables. Imports declined to 42,314 tons from 47,486 tons. The division also has broken down galvanized sheets and black and galvanized welded pipe so that they are now divided into iron and steel lines, instead of being combined, as previously.

Scrap continued to be the heaviest item of exportation in January, totaling 61,865 tons, of which Japan took 23,275 tons. Canada took 12,487 tons; Sweden, 10,216 tons; Germany, 7091 tons; Chile, 2516 tons; and China, 1961 tons. The largest movement in finished lines related to tin plate, with a total of 25,026 tons, of which Japan took 7133 tons. China took 3170 tons; Argentina, 2567 tons; Canada, 2138 tons; Mexico, 1685 tons; and British India, 1537 tons.

Exports of plain structural shapes were 14,109 tons of which 11,998 tons went to Canada. Of the 11,857 tons of steel bars exported, 6125 tons went to Canada and 2831 tons to the United Kingdom. Canada took 7856 tons of the 10,061 tons of plates and 5643 tons of the 12,959 tons of black steel sheets exported, while 1671 tons of the latter product went to Japan.

Exports of galvanized sheets to Canada were 3229 tons and the Philippine Islands took 2008 tons. Exports of casing and oil line pipe, totaling 7742 tons, were widely distributed among the world markets, the heaviest shipments, 2645 tons, going to Venezuela, while Colombia took 1007 tons.

Exports to Canada in January totaled 73,340 tons and Japan ranked

Exports of Iron and Steel from the United States

(In Gross Tons)

	January, 1930	December, 1929	January, 1929
Pig iron	2,133	1,619	3,769
Ferromanganese	125	83	168
Scrap	61,865	56,473	50,753
Pig iron, ferroalloys and scrap	*64,123*	*58,175*	*54,690*
Ingots, blooms, billets, sheet bar	3,329	784	1,901
Skelp	4,754	1,636	2,819
Wire rods	3,481	3,056	4,411
Semi-finished steel	*11,564*	*5,476*	*9,131*
Steel bars	11,857	8,268	22,406
Alloy steel bars	1,041	1,377	1,785
Iron bars	231	221	1,311
Plates, iron and steel	10,061	11,305	17,385
Galvanized iron sheets (a)	705	12,078	16,423
Galvanized steel sheets (a)	10,449		
Sheets, black steel	12,959	9,365	13,465
Sheets, black iron	1,217	1,205	1,003
Hoops, bands, strip steel	3,323	5,207	6,891
Tin plate; terne plate	25,026	24,522	26,387
Structural shapes, plain material	14,109	14,841	17,259
Structural material, fabricated	11,021	5,848	10,742
Tanks (b)	1,245	.....	.....
Steel rails	5,877	10,034	17,883
Rail fastenings, switches, frogs, etc.	1,669	2,954	2,627
Boiler tubes	1,478	1,918	1,524
Casing and oil line pipe	7,742	6,983	16,330
Black and galvanized welded iron pipe (a)	2,801	15,278	10,344
Black and galvanized welded steel pipe (a)	9,660		
Plain wire	2,891	3,275	3,845
Barbed wire and woven wire fencing	2,414	4,397	6,529
Wire cloth and screening	187	113	152
Wire rope	412	375	620
Wire nails	517	806	1,498
Other nails and tacks	634	642	894
Horseshoes	3	9	21
Bolts, nuts, rivets and washers, except track	1,122	1,479	1,411
Rolled and finished steel	*140,651*	*142,500*	*198,735*
Cast iron pipe and fittings	2,992	3,610	2,257
Car wheels and axles	908	1,177	2,818
Malleable iron screwed fittings	1,495	1,232	1,135
Iron castings	664	697	1,181
Steel castings	606	503	1,444
Forgings	748	710	1,242
Castings and forgings	*7,413*	*7,929*	*10,077*
All other	1,339	1,162	1,663
Total	225,090	215,242	274,296

(a) Not separated between iron and steel, prior to 1930.
(b) Not heretofore included.

Imports of Iron and Steel into the United States

(In Gross Tons)

	January, 1930	December, 1929	January, 1929
Pig iron	9,080	17,172	16,108
Ferromanganese*	4,180	3,229	5,502
Ferrochrome†	45	48	28
Ferrosilicon‡	469	453	446
Scrap	4,055	1,759	7,207
Pig iron, ferroalloys and scrap	*17,829*	*22,661*	*29,291*
Steel ingots, blooms, billets and slabs	1,785	1,705	1,717
Wire rods	944	1,039	1,183
Semi-finished steel	*2,729*	*2,744*	*2,900*
Rails and splice bars	599	199	71
Structural shapes	8,950	8,243	9,470
Boiler and other plates	657	.....	73
Sheets and saw plates	2,056	2,540	827
Steel bars	2,299	2,805	3,134
Bar iron	115	319	239
Hoops, bands and cotton ties	708	1,563	1,182
Tubular products (wrought)	3,264	3,020	2,659
Nails, tacks, staples	595	740	708
Tin plate	9	19	41
Bolts, nuts, rivets and washers	26	74	18
Round iron and steel wire	447	476	602
Barbed wire	377	544	285
Flat wire; strip steel	209	154	149
Wire rope and strand	297	222	133
Other wire	55	63	41
Rolled and finished steel	*20,663*	*20,981*	*19,632*
Cast iron pipe	952	975	2,760
Castings and forgings	141	125	210
Total	42,314	47,486	54,793
Manganese ore*	38,622	15,302	15,344
Iron ore	292,835	286,055	178,790
Magnesite	9,267	1,458	2,521

*Manganese content only.
†Chromium content only.
‡Silicon content only.

Destination of Iron and Steel Exports from the United States

(In Gross Tons)

Country of Destination	January, 1930	December, 1929	January, 1929
North and Central America and the West Indies	*91,867*	*82,329*	*120,136*
Canada and Newfoundland	73,411	61,312	90,453
Cuba	3,469	4,663	6,888
Guatemala	319	453	528
Honduras	711	385	892
Mexico	9,114	11,321	7,930
Panama	1,076	1,233	2,239
Salvador	360	177	1,689
British West Indies	1,251	1,240	5,256
Other West Indies	1,808	1,251	3,600
Other Central America	348	294	661
South America	*36,315*	*32,957*	*45,260*
Argentina	6,034	9,628	12,260
Brazil	4,831	6,360	5,427
Chile	9,236	3,897	5,678
Colombia	5,672	2,715	3,687
Peru	1,710	2,234	3,836
Uruguay	1,038	1,932	1,238
Venezuela	7,362	5,521	12,684
Other South America	432	670	450
Europe	*30,632*	*16,026*	*36,315*
France	793	634	1,244
Germany	2,652	30	2,923
Italy	8,487	6,405	14,799
Poland and Danzig	1	4	10,029
Spain	10,313	141	343
Sweden	551	196	460
Soviet Russia	430	2,543	70
United Kingdom	5,394	4,591	5,535
Other Europe	2,011	1,482	942
Far East	*64,032*	*78,535*	*70,623*
British Malaya	1,082	438	1,084
China	6,929	4,190	8,910
Dutch East Indies	3,119	3,754	8,149
India and Ceylon	3,354	941	1,286
Hongkong	1,071	408	1,173
Japan	39,010	54,338	37,515
Kwantung	393	505	568
Philippine Islands	5,677	9,433	9,112
Australia	1,578	1,296	1,851
New Zealand	522	304	768
Other Asia and Far East	1,297	2,928	207
Africa	*2,244*	*5,395*	*1,932*
Union of South Africa	123	328	134
Egypt	1,964	4,977	1,746
Mozambique	136	71	22
Other Africa	21	19	30
Total	225,090	215,242	274,296

second as a destination of American iron and steel shipments for that month, taking 39,010 tons.

The largest item of importation in January was pig iron, the incoming movement being 9080 tons, of which 5884 tons came from India and 2158 tons from the United Kingdom. Of the 8950 tons of structural shapes imported, 6065 tons came from Belgium; 1399 tons from Germany and 1134 tons from France.

Sweden was the chief source of incoming shipments of steel bars, supplying 827 tons of the total of 2299 tons. Belgium furnished 594 tons; Germany, 394 tons, and France, 333 tons. The total was the smallest since last March.

France gave way to Belgium as the principal source of imports of cast iron pipe in January, providing 637 tons of the total of only 952 tons, the smallest since January, 1925. Imports from France were 309 tons.

Imports of "other pipe," largely consisting of seamless steel tubes, totaled 3264 tons, of which 2414 tons came from Germany, 307 tons from Canada and 244 tons from the United Kingdom.

IMPORTS OF IRON AND STEEL PRODUCTS INTO THE UNITED STATES

(In Gross Tons)

	Jan.	Dec.	Nov.
Austria	19	45	1
Belgium	9,966	7,458	10,410
Czechoslovakia	36	31	53
Denmark	150	....	5
France	3,266	2,871	4,768
Germany	7,545	9,470	9,218
Italy	192	96	601
Netherlands	448	3,833	675
Norway	188	1,125	1,408
Sweden	2,513	2,864	4,043
Switzerland	1	5	4
United Kingdom	5,109	7,461	6,473
Europe	*29,433*	*35,259*	*37,659*
Canada	6,837	3,426	9,010
Mexico	25	....	....
Panama	....	....	41
Cuba	47	....	228
British India	5,884	8,798	7,053
Japan	88	2	6
China	....	....	44
Hongkong	....	1	....
Total	42,314	47,486	54,041

Canada supplied 2168 tons of the 4180 tons of ferromanganese imported, while 1957 tons came from the United Kingdom. Of the 38,622 tons of manganese concentrates imported in January, 21,815 tons came from Soviet Russia, 10,396 tons from Brazil, 3827 tons from the Gold Coast of Africa and 2080 tons from India.

Belgium supplied 9966 tons of iron and steel items in January; Germany, 7545 tons; Canada, 6837 tons; British India, 5884 tons (all pig iron); Great Britain, 5109 tons; and France, 3266 tons.

Steel Output in Canada Gained in January

TORONTO, ONT., March 4.—Production of pig iron in Canada in January amounted to 87,079 tons. This was 5 per cent over the 82,632 tons of December, 1929, and while slightly under the 87,764 tons made in January, 1929, it was the second largest tonnage reported for any January since 1919, when 93,000 tons was produced.

Gains over the December figures were due to an increase in the output of basic iron to 48,898 tons from 45,295 tons and in malleable iron to 8108 tons from 4901 tons. Foundry iron was slightly lower at 30,073 tons, as compared with 32,436 tons in December.

Production of ferroalloys in Canada in January, at 6943 tons, was slightly under the 6986 tons reported for December.

Production of steel ingots and direct steel castings, at 115,200 tons, was 40 per cent over the 82,415 tons of the previous month, but slightly under the 116,260 tons reported for January, 1929. Compared with the figures for December, data for January showed an advance in the output of steel ingots to 108,644 tons from 76,389 tons and in steel castings to 6556 tons from 6026 tons. Of the month's total, all but 84 tons of the ingots and 308 tons of the castings were made for further use of the producers, the remainder being intended for sale.

Gain in World Automobile Registrations

Automobile registrations throughout the world in 1929 reached a total of 34,950,915, excluding motorcycles, which totaled 2,566,701, says *Automotive Industries* in its annual statistical issue. Of the total vehicle registrations, there were 26,634,210 in the United States, an increase of 8.7 per cent over the high record of 1928. In the record-breaking production of last year, automobile companies in the United States and Canada turned out 5,621,656 passenger cars and trucks. Of this total, dealers in the United States sold approximately 4,012,000 passenger cars.

In the compilation of the trend toward consolidation in the industry, it is found that there were effected 94 combinations, involving over 160 companies and organizations during the past 14 months.

Large Spiegeleisen Imports Last Year

Imports of spiegeleisen from Great Britain and Germany in 1929 into the United States were the largest in the last three years. Official data, not usually published, show that the 1929 total was 13,828 gross tons. This compares with 5218 tons in 1928 and 7460 tons in 1927. The 1929 imports were therefore nearly three times those in 1928.

The value of the 13,828 tons, imported last year, is placed at $403,853, which is about $29 per ton.

Driver-Harris Co., Harrison, N. J., manufacturer of special alloys, has been awarded a gold medal for its exhibition at the "Exposition Internacional de Barcelona 1929."

Machinery Exports Near High Record

January Was Fourth Largest Month, Only 6 Per Cent Behind Last March—Agricultural Machinery Makes Huge Total

WASHINGTON, Feb. 27.—Reflecting a gain of $6,769,126, exports of machinery of all kinds rose to a value of $56,352,907 in January, from $49,583,781 in December. In January of last year they were valued at $49,906,187. The January total has been exceeded only twice in the last nine years and only three times altogether. The record of $59,507,795 was made last March.

Exports of machinery and vehicles in January were valued at $88,864,104, against $78,610,475 in December and $99,872,568 in January, 1929. The loss in January when compared with last year was due to the decline in exports of automobiles.

Exports of industrial machinery, as classified by the Division of Statistics, Department of Commerce, were valued at $24,590,055 in January, against $21,490,552 in December and $22,037,785 in January of last year. Outgoing shipments of power-driven metal-working machinery in January total $3,215,109, compared with $2,670,402 in December and $2,531,415 in January, 1929. As listed in THE IRON AGE table, 1223 units, valued at $1,641,621, were exported in January, against 837, valued at $1,342,623, in December.

Imports of machinery and vehicles in January were valued at $3,163,596, compared with $2,891,397 in January of last year. Imports of machinery as listed in THE IRON AGE table were valued at $2,506,749 in January, against $2,530,065 in December and $2,179,175 in January of last year. Imports of industrial, office and printing machinery in January were valued at $2,113,268, against $1,876,758 in December and $1,844,952 in January, 1929.

Market Data Handbook Wins Harvard Award

WASHINGTON, March 4.—For his work in compiling the "Market Data Handbook of the United States," Paul W. Stewart, domestic commerce division, Department of Commerce, has been given the Harvard award for scientific research in advertising, carrying a cash prize of $2,000.

This is one of a series of awards established in 1923 by the late Edward W. Bok in the Harvard Business School in the belief that higher standards of effort in planning and execution of advertising might be stimulated thereby. The award was the first of the kind ever given for work in connection with a Government publication and it came as a surprise to Mr. Stewart.

Mr. Stewart, born in Bradenville, Pa., 32 years ago, was graduated as honor student at the University of Pittsburgh, School of Business Administration, Bachelor of Science in Economics, 1923, and took a post-graduate course in the University of Pittsburgh Law School. He became associated with the editorial division of the Bureau of Foreign and Domestic Commerce in April, 1924, remaining in that service until February, 1926, when he took up his work with the domestic commerce division.

Machinery Exports from the United States

(By Value, in Thousands of Dollars)

	January, 1930	December, 1929	January, 1929
Locomotives	$20	$730	$327
Other steam engines	55	99	97
Boilers	221	211	138
Accessories and parts	65	153	61
Automobile engines	294	178	858
Other internal combustion engines	766	688	839
Accessories and parts	420	276	292
Electric locomotives	85	179	108
Other electric machinery and apparatus	987	1,188	1,072
Excavating machinery	1,093	672	518
Concrete mixers	93	76	71
Road-making machinery	392	144	183
Elevators and elevator machinery	654	413	434
Mining and quarrying machinery	1,842	1,140	1,339
Oil-well machinery	2,674	2,002	1,170
Pumps	1,017	899	1,187
Bending and power presses	281	260	236
Forging machinery	284	161	135
Machine tools*	1,889	2,130	1,465
Rolling machines	91	119	135
Other metal-working machinery and parts	671	488	586
Textile machinery	1,039	1,390	1,119
Sewing machines	729	777	878
Shoe machinery	158	188	205
Flour-mill and gristmill mach'ry	21	78	76
Sugar-mill machinery	252	157	144
Paper and pulp-mill machinery	236	183	285
Sawmill machinery	108	78	71
Other woodworking machinery	241	298	188
Refrigerating and ice-making machinery	213	641	503
Air compressors	664	463	646
Typewriters	2,206	1,432	2,000
Power laundry machinery	125	117	220
Typesetting machines	356	450	612
Printing presses	519	416	562
Agricultural machinery and implements	13,693	12,273	12,420
All other machinery and parts	21,899	18,437	18,726
Total	$56,353	$49,584	$49,906

*Principal details are shown in another table.

Imports of Machinery into the United States

(By Value)

	January, 1930	December, 1929	January, 1929
Metal-working machine tools	$415,464	$124,915	$79,808
Agricultural machinery and implements	711,510	1,229,486	413,667
Electrical machinery and apparatus	154,449	118,934	176,290
Other power-generating machinery	85,044	24,025	64,960
Other machinery	956,913	812,236	987,962
Vehicles, except agricultural	183,369	220,469	456,488
Total	$2,506,749	$2,530,065	$2,179,175

Exports of Power-Driven Metal-Working Machinery

	January, 1930		December, 1929	
	No.	Value	No.	Value
Engine lathes	58	$98,240	79	$112,975
Turret lathes	33	56,779	54	114,108
Other lathes	93	95,606	50	148,092
Vertical boring mills and chucking machines	27	77,950	6	9,182
Thread-cutting and automatic screw machines	90	137,504	107	196,958
Knee and column-type milling machines	44	118,334	51	115,295
Other milling machines	125	363,303	58	151,295
Gear-cutting machines	42	74,768	18	58,388
Vertical drilling machines	81	96,699	24	11,583
Radial drilling machines	3	10,917	21	42,920
Other drilling machines	281	80,246	104	65,882
Planers and shapers	45	102,998	26	50,652
External cylindrical grinding machines	51	147,970	67	114,891
Internal grinding machines	26	77,553	43	76,332
Metal-working tool-sharpening machines	224	102,754	129	74,069
Total	1,223	$1,641,621	837	$1,342,623

Foundry Operation Reported Near Normal

Normal production for 128 foundries reporting to the Gray Iron Institute is 25,673 net tons, this being the average monthly production of the last three calendar years. January production of those same foundries is reported at 22,722 tons, or 88.5 per cent of normal.

New business received during the month reported by 71 of these foundries was 11,683 tons, or 89.4 per cent of their normal production, compared with 70.3 per cent in December. Unfilled orders at the close of the month, reported by 69 foundries, was 7435 tons, or 51 per cent of their normal production.

Material received by 103 foundries was reported as 20,070 tons, or sufficient for 89.3 per cent of their normal production. This includes all grades of pig iron and of scrap received during January. Material on hand in the yards of 106 of these foundries showed 33,872 tons, or 154.8 per cent of a normal month's requirements.

Business outlook was reported by 110 foundries as follows: Good, 16, compared with 11 from 102 foundries in December; fair, 72, compared with 58 in December; poor, 17, compared with 30 in December; bad, 5, compared with 3 in December. This shows a strong increase in the good and fair reports.

Reporting by size of foundry, it appears that the smallest units are doing best. Those with normal production under 100 tons a month made in January 112.3 per cent of their normal. Those with normal production 101 to 250 tons a month made 100.6 per cent of normal. Those with normal 251 to 400 tons made 84.6 per cent of normal. Those with normal production of 401 tons and more made 79.9 per cent of normal.

There was little to choose geographically, as the three large districts into which the country is arbitrarily divided by the institute showed approximately the same ratio of production to normal.

Reduced Extras on Wide, High Finished Sheets

Changes in size extras on full pickled, full cold-rolled automobile and furniture sheets, and all grades of patent leveled sheets, which were mentioned briefly in THE IRON AGE last week, affect only widths 44 in. and wider in gages from No. 10 to No. 21. On Nos. 10 to 16 gage the reductions range from 5c. to 20c. per 100 lb.; on Nos. 17 and 18 from 5c. to 60c. per 100 lb., and on Nos. 19 and 21 from 10c. to 50c. per 100 lb. Comparison of old and new size extras, as adopted by a number of leading makers, is shown in the following:

Gage	Widths in Inches: 36 to 38	38 to 40	40 to 44	44 to 48	48 to 50	50 to 52	52 to 54	54 to 56	56 to 58	58 to 60	60 to 66	66 to 68	68 to 70	70 to 72	
	In Cents per 100 Lb.														
10–16	0.10	0.10	0.10	0.20	0.35	0.35	0.50	0.65	0.80	1.00	1.00	1.25	1.50	2.00	Present
	0.10	0.10	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.20	1.30	1.80	New
17–18	0.10	0.10	0.20	0.35	0.50	0.75	0.75	0.90	1.25	1.50	1.50	1.75	2.00	2.50	Present
	0.10	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.30	1.40	1.90	New
19–21	0.10	0.20	0.30	0.50	0.60	0.75	0.90	1.00	1.50	1.50	1.50	1.75	2.00	2.50	Present
	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.40	1.50	2.00	New
22	0.40	0.40	0.80	1.25	1.25										Present
	0.40	0.40	0.80	1.25	1.25										New
23–24	0.40	0.40	0.80	1.25											Present
	0.40	0.40	0.80	1.25											New

Large Regional Foundry Meeting in Illinois

The first regional meeting ever held by the American Foundrymen's Association in cooperation with a district foundrymen's association will be held in Moline, Ill., on Wednesday, March 26. This event, sponsored jointly by the A. F. A. and the Quad City Foundrymen's Association, will attract a large number of foundrymen from the Middle West and elsewhere.

In the morning, inspection trips will be made to plants in the Quad Cities district, which includes Moline, East Moline, and Rock Island, Ill., and Davenport and Bettendorf, Iowa. One of the largest foundry centers in the country, this territory includes fully 36 foundries—22 producing gray iron, 10 non-ferrous, three malleable and two steel castings.

This section has long been important in the production of agricultural implements, and today contains some of the largest shops in the United States producing castings for agricultural purposes. Among the more important plants maintaining foundries are those of the John Deere Co., Moline Implement Co. and Rock Island Plow Co.

At 12.15 p. m., six round table luncheon meetings will be held covering cupola practice, steel and malleable founding, gating and risering, non-ferrous practice and foundry costs. Prominent foundrymen who will lead these discussion groups are as follows:

Cupola practice and high test cast iron: Chairman, F. B. Coyle, International Nickel Co., New York. Steel founding: Chairman, L. S. Peregoy, Sivyer Steel Casting Co., Milwaukee. Malleable founding: Chairman, P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill. Non-ferrous practice: Chairman, R. R. Monroe, Des Moines Foundry & Machine Co., Des Moines, Iowa. Foundry costs: Chairman, C. E. Mitchell, Gray Iron Institute, Cleveland. Gating and risering: Chairman, E. W. Smith, Crane Co., Chicago.

At 3 p. m., a technical session will be held, with two papers scheduled for reading and discussion. R. F. Harrington, Hunt-Spiller Mfg. Corporation, Boston, and chairman of the A. F. A. subcommittee on foundry sand reclamation, will deal with "Foundry Sand Control." The other paper will be by E. W. Page, Victor X-Ray Corporation, Chicago, on the subject of "X-Ray Examination of Castings."

Much credit for the regional meeting plans is due John H. Ploehn, French & Hecht, Inc., Davenport, as chairman of the committee on reception and arrangements. A. E. Hageboeck, Frank Foundries Corporation, Moline, is in charge of the round table groups; H. Bornstein, Deere & Co., Moline, of the technical session, and J. H. Diedrich, Blackhawk Foundry & Machine Co., Davenport, of the plant visitations.

A banquet will be served at 6.30 in the evening, at which the chief speaker will be S. W. Utley, Detroit Steel Casting Co., Detroit, a director and past president of the A. F. A.

Small Nitriding Furnace for Experimental Use

Due to the demand for a small nitriding furnace, suitable for experimental purposes or for production in limited quantities, the Hevi Duty Electric Co., 4100 Highland Avenue, Milwaukee, has developed a small nitriding electric furnace of the forced circulation type.

This furnace, known as Type MU-500-N, follows closely in design the larger production furnaces, in that it consists essentially of the usual type of pit furnace enclosing an alloy retort that is bolted and sealed to the furnace cover. A centrifugal fan is supported by the cover for producing rapid circulation of the gases in the furnace.

Like the production furnaces, this type permits charging the work to be nitrided in an alloy basket 8 in. in diameter by 20 in. deep. The basket is placed in a retort which is bolted and sealed to the furnace cover, all external to the furnace. The retort is then gassed to exhaust all of the air and is then placed in the furnace that is already up to temperature. Upon conclusion of the nitriding cycle, the retort is removed from the furnace and the ammonia flow is continued through the work while cooling down. Another charged retort can then be placed in the furnace without interruption of heating.

The furnace permits a practically continuous use of the furnace without long delays and interruptions to the heating cycles caused by the cooling down and gassing, which usually comprises about 10 hr. It has an electrical input of 3.5 kw. at 220 or 110 volts, with automatic temperature control.

Machinery Markets and News of the Works

Sales Continue Light

Machine Tool Business Shows No Improvement But Inquiries Are Plentiful

MACHINE tool business has shown little, if any, gains in the past week. With few exceptions, sellers did no more business in February than in January.

Prospects for March are more encouraging from the standpoint of pending business, but buyers seem reluctant to place orders until general improvement in business is definitely assured.

Considering that seasonal influences this month may bring betterment, there is a possibility that some of the inquiries on which quotations have recently been made will result in orders.

Motor car manufacturers and parts makers have placed orders at Cleveland during the past week for a number of tools. Some makers of stampings, forgings and other automobile parts are fairly busy, but others are operating their plants at considerably below capacity.

Deliveries of many lines of machine tools are shortening as unfilled orders are reduced. Production, though still fairly good, is below the high level of a year ago.

New York

NEW YORK, March 4.—Machine tool business has shown no gain in the past week. In fact, for some sellers, it was quieter than the week before. A good deal of business is pending, but prospective buyers seem to be cautious about undertaking expenditures before business shows another move forward. It is believed that March should bring clearer indications of the general business trend.

Continental Can Co., 1 Pershing Square, New York, has acquired property of American Export Motors, Inc., Grand Boulevard, Jacksonville, Fla., for branch plant in that city, and will remodel for manufacture of tin containers. Part of equipment will be transferred from another factory and additional machinery purchased.

William Shary, 41 Union Square, New York, architect, has filed plans for a seven-story automobile service, repair and garage building, 75 x 101 ft., at 205 West 101st Street, to cost about $160,000 with equipment.

Bell Telephone Laboratories, Inc., 463 West Street, New York, manufacturer of telephone experimental apparatus, radio equipment, etc., has plans for extensions and improvements in thirteen-story factory, to cost about $100,000. Voorhies, Gmelin & Walker, 101 Park Avenue, are architects.

United States Trucking Corporation, 17 Battery Place, New York, is planning to rebuild part of two-story automobile service and garage building on West Eighteenth Street, destroyed by fire Feb. 27.

Joseph Leopold, president, Consolidated Instrument Co. of America, Inc., 305 West Forty-seventh Street, New York, and associates have organized General Motive Control, Inc., with capital of 1,000,000 shares of stock, no par value, to take over and operate American Viscosimeter Co., Inc., New York, manufacturer of viscosity meters for oil gages, and other mechanical and electrical devices. It is proposed to add other units to organization, of which Mr. Leopold will be head.

Slee & Bryson, 160 Montague Street, Brooklyn, architects, have asked bids on general contract for a five-story automobile service, repair and garage building, to cost $150,000 with equipment.

Procter & Gamble Co., 205 West Forty-second Street, New York, with headquarters at Cincinnati, has asked bids on general contract for two additions to plant at Port Ivory, S. I., one and two-stories, respectively, to cost over $65,000 with equipment. Stone & Webster Engineering Co., 120 Broadway, is architect and engineer.

Delaware, Lackawanna & Western Railroad Co., 90 West Street, New York, C. C. Hubbell, purchasing agent, will receive bids until March 14, for 10 motor-generator sets, 17 storage batteries, 8 battery charging rectifiers, and 5 control panels.

Associated Oil Co., 11 Broadway, New York, is planning expansion, to cost about $20,000,000, including extensions in refineries, oil storage and distributing plants and other operating properties. William F. Humphrey is president.

Bakelite Corporation, 247 Park Avenue, New York, manufacturer of rubberized insulating materials, etc., has asked bids on general contract for three-story addition to plant at Bloomfield, N. J., 54 x 154 ft., to cost over $100,000 with equipment. Robert Bolton, 45 Branford Place, Newark, N. J., is architect.

L. F. Caproni & Co., 1056 Chapel Street, New Haven, Conn., architects and engineers, have plans for a stone-crushing and distributing plant, 50 x 150 ft., at Hastings-on-Hudson, N. Y., for company whose name is temporarily withheld, to cost about $60,000 with machinery.

Westinghouse Electric & Mfg. Co., East Pittsburgh, will soon begin superstructure for two-story factory branch and distributing plant, 300 x 330 ft., at State Highway and Haynes Avenue, Newark, for which general contract was recently let to Public Service Production Co., 80 Park Place, Newark, reported to cost over $400,000 with equipment. Other units will be built at later date. John H. and Wilson C. Ely, 605 Broad Street, Newark, are architects.

Northern New Jersey Oil Co., 395 Riverside Avenue, Newark, has revised plans for one and two-story storage and distributing plant, including tanks, etc., to cost over $60,000 with equipment. Enbro Corporation, 111 Academy Street, is architect.

Tung-Sol Lamp Works, Inc., Eighth Avenue and High Street, Newark, manufacturer of electric lamps, etc., has leased one-story factory at 85-87 Eighth Avenue, for expansion.

Newark Special Tool & Machine Co., 51 Lawrence Street, Newark, has filed plans for one-story plant, 90 x 112 ft., to cost about $24,000 with equipment. Michael B. Silberstein, 964 Broad Street, is architect.

Barber Asphalt Co., Maurer, Perth Amboy, N. J., has plans for two-story laboratory and engineering building, 50 x 120 ft., to cost over $100,000 with equipment. Day & Zimmerman Engineering & Construction Co., 112 North Broad Street, Philadelphia, is engineer.

Moore Trench Machine Co., Rockaway, N. J., manufacturer of excavating machinery and well point equipment, has added a new two-story building, 90 x 139 ft., for expansion.

Triplex Machine Tool Corporation, 50 Church Street, New York, has been appointed by Porter-Cable Machine Co., Syracuse, as dealer in Porter-Cable manufacturing lathes in New York city and vicinity.

New England

BOSTON, March 3.—Dealers report no improvement in machine tool sales and inquiries. Old prospects give no indication of closing on tools which have been under negotiation for months, and apparently are waiting until the general business situation improves. The most important sale the past week was two large tools by a Worcester builder to the Buick automobile company. These machines were in stock and will be shipped immediately. Delivery schedules are improving.

Henry K. Barnes Co., Salem, Mass., belting manufacturer, will soon start work on a three-story addition.

Malden Machine Tool Co., Malden, Mass., has awarded contract for a machine shop to cost $15,000 without equipment.

General Radio Co., Cambridge, Mass., will soon take bids on a four-story plant, to cost $80,000 without equipment.

Board of Education, Meriden, Conn., will have plans ready about March 21 for a three-story trade school, 50 x 200 ft., with two wings, 50 x 63 ft.

Geometric Tool Co., New Haven, Conn., reports that January bookings exceeded those in December about 40 per cent, and those in January, 1929, about 3 per cent. February bookings were about 20 per cent larger than January.

Somerville Iron Foundry Co., 88 Washington Street, Somerville, Mass., is planning new one-story foundry, to cost about $45,000 with equipment. Nathan P. Reed is head.

Agar Mfg. Corporation, Warwick Place, Somerville, Mass., manufacturer of corrugated paper boxes and containers, has awarded a general contract to Chase & Gilbert, Park Square Building, Boston, for a one-story addition, 100 x 245 ft., to cost about $80,000 with equipment.

Hain Brothers, Railroad Yard, South Norwalk, Conn., have plans for a one and two-story ice-manufacturing plant, 52 x 150 ft., to cost about $60,000 with machinery. Harry Koerner, Bridgeport, Conn., is architect.

L. G. Balfour, Attleboro, Mass., manufacturer of jewelry specialties, plated goods, etc., has approved plans for first unit of one and three-story addition, 40 x 60 ft., and 40 x 340 ft., entire project to cost more than $150,000.

Westfield Boys' Trade School, Westfield, Mass., has plans for a two-story and basement addition, 75 x 180 ft., to cost about $90,000. J. William Beal Sons, 185 Devonshire Street, Boston, are architects; Ralph M. Sizer, 12 Elm Street, Westfield, is associate architect.

Officials of Waterbury Clock Co., Waterbury, Conn., have organized Ingersoll-Waterbury Co., with capital of $100,000, as affiliated interest, to operate primarily for sales and distribution of products of parent company. Irving H. Chase will be president, and Charles H. Granger, vice-president.

N. N. Hill Brass Co., 25 Skinner Street, East Hampton, Conn., has awarded a general contract to Newton P. Clark, 350 Ridge Road, Wethersfield, Conn., for a two-story addition, 40 x 100 ft., to cost about $45,000 with equipment.

Philadelphia

PHILADELPHIA, March 3.—Gulf Refining Co., Sydenham and Locust Streets, Philadelphia, has asked bids on general contract for one-story mechanical shop at Girard Point, to cost about $40,000 with equipment. Headquarters are in Frick Annex, Pittsburgh.

Astra Novelty Lighting Corporation, Philadelphia, has leased property at 1918-22 Germantown Avenue, for manufacture of electric lighting equipment.

Globe Metal Mfg. Co., 2122 East Hazzard Street, Philadelphia, has leased building at Emerald and Hagert Streets, and space in an adjoining structure, totaling 16,000 sq. ft. floor area, for expansion.

The Crane Market

INQUIRY for overhead traveling cranes continues rather limited. In the New York district there is one list of small cranes, but otherwise inquiries are for individual units. Competition among builders is keen with most makers able to offer earlier delivery than a month or six weeks ago.

The Standard Oil Co. of Indiana, Whiting, Ind., is inquiring for a 30-ton power house crane. The Illinois Steel Co., South Works, has closed on three 10-ton heavy mill type overhead electric cranes with the Alliance Machine Co. The Chicago Tribune Co., Chicago, has purchased two electrically operated hammer-head cranes for pier operation from the Orton Crane & Shovel Co. The Granite City Steel Co., Granite City, Ill., is inquiring for two 10-ton, 75-ft. span overhead cranes. The Fulton Iron Works, St. Louis, has purchased a 10-ton, 60-ft. span and a 20-ton, 67-ft. span overhead cranes from the Whiting Corporation, and Black, Sivalls & Bryson, Kansas City, Mo., have closed on a 5-ton and 7-ton, 70-ft. span overhead cranes, also with the Whiting Corporation.

Industrial users of locomotive cranes are providing most of the current business. Although contractors have received the award of some sizable projects and are bidding for others, in most cases they have sufficient equipment for the present. Meanwhile, the railroads have not yet shown much activity, except for the Central Railroad of New Jersey, which is asking for a 25-ton locomotive crane. The Bethlehem Steel Co. has closed on two 25-ton cranes for Johnstown, Pa., with the Browning Crane Co. and the Ohio Locomotive Crane Co.

John Lucas & Co., Inc., 322 Race Street, Philadelphia, manufacturer of paints, varnishes, etc., is planning to rebuild part of plant, including storage and distributing units and power house, at Gibbsboro, N. J., recently destroyed by fire. Ernest T. Trigg is general manager.

Cramp Brass & Iron Foundries Co., Richmond and Norris Streets, Philadelphia, has taken title to a group of eight two-story buildings at 2641-63 East York Street, heretofore held by William Cramp & Sons Ship & Engine Building Co., of which first-noted is a subsidiary, to be used for foundry service.

Duesenberg Motors Co. of Philadelphia, Inc., Philadelphia, a subsidiary of Duesenberg, Inc., Indianapolis, manufacturer of automobiles, has leased property at 1712-14 Race Street, Parkway and Eighteenth Street, 117 x 144 ft., formerly occupied by Thorton-Fuller Automobile Co., for new service, repair and sales building.

Trenton Potteries Co., Clinton and Ott Streets, Trenton, N. J., manufacturer of sanitary ware, has awarded general contract to Karno Smith, Inc., Broad Street Bank Building, for five-story and basement addition, 63 x 195 ft., and 63 x 168 ft., to cost about $175,000 with equipment. Lockwood Greene Engineers, Inc., 100 East Forty-second Street, New York, is architect and engineer.

Reading Co., Reading Terminal, Philadelphia, has awarded general contract to William Steele & Sons Co., Fifteenth and Cherry Streets, for six-story addition to terminal, storage and warehouse building, to cost $630,000. Company engineering department is in charge.

Hershey Machine & Foundry Co., Manheim, Pa., has plans for one-story addition, to cost about $45,000 with equipment. M. R. Evans is [illegible]an, architect.

Scott & Williams, Inc., 366 Broadway, New York, manufacturer of knitting machinery and parts, has purchased plant and business of Standard-Trump Brothers Machine Co., Wilmington, Del., and will operate as a unit of organization. Plant will be continued under present name.

Board of Commissioners, Delaware County, Media, Pa., has plans for central steam power plant at Concord, Pa., reported to cost over $70,000 with equipment. George S. Idell, 1510 Chestnut Street, Philadelphia, is architect and engineer.

South Atlantic

BALTIMORE, March 3.—Potomac Electric Power Co., Fourteenth and C Streets, N. W., Washington, has plans for an addition to Bennings steam-operated electric generating plant, Bennings, D. C., including installation of 30,000-kw. turbo-generator and auxiliary equipment, to cost more than $2,500,000. Stone & Webster Engineering Corporation, Boston, is engineer. Company also has plans for five-story equipment storage, service and distributing plant, including automobile repair and garage unit, to cost about $250,000 with equipment. A. B. Heaton, 1211 Connecticut Avenue, N. W., Washington, is architect.

Sellmayer Packing Co., 531 South Conkling Street, Baltimore, will soon take bids on revised plans for three-story cold storage and refrigerating plant, to cost about $150,000 with machinery. G. J. Sellmayer is president.

Baltimore Airport, Inc., Hanover and York Streets, Baltimore, Frederick Neesemann, president, is arranging for hangars, repair and reconditioning shop and other field buildings at airport at Windsor Mill and Rolling Roads, to cost over $85,000 with equipment. C. L. Ofenstein, Atlantic Seaboard Airways, Inc., 1716 H Street, N. W., Washington, is aeronautical engineer, in charge.

Blue Diamond Coal Co., Holston Bank Building, Knoxville, Tenn., has begun expansion and improvements at mining properties at Bonny Blue, Va., to cost over $500,000, including construction of two steel tipples and installation of operating machinery.

Crown Oil & Wax Co., 200 South Eighth Street, Baltimore, has plans for a three-story automobile service, repair and garage building for company trucks and cars, to cost about $85,000 with equipment.

Standard Oil Co. of New Jersey, 26 Broadway, New York, and St. Paul Place, Baltimore, has awarded general contract to W. A. Crary & Sons, 1226 Sumter Street, Columbia, S. C., for local oil storage and distributing plant, consisting of main two-story unit, 60 x 125 ft., with one-story automobile service and garage building, 100 x 160 ft., and three-story office, to cost $275,000 with equipment.

Standard Ice & Fuel Co., 700 West Ninth Street, Charlotte, N. C., plans improvements in ice-manufacturing plant, including installation of Diesel engine unit and auxiliary equipment, to cost about $30,000.

Mount Lime & Chemical Corporation, Lynchburg, Va., is contemplating lime

manufacturing plant near Natural Bridge, Va., to cost over $80,000 with equipment.

Shell Petroleum Corporation, Shell Building, St. Louis, has awarded general contract to Voss Construction Co., 1218 Olive Street, for oil storage and distributing plant at Atlanta, Ga., to cost over $90,000 with equipment.

Savannah Iron & Wire Works, Inc., Savannah, Ga., has removed its plant to larger quarters at 234-8 East Broad Street, where it will occupy about 12,000 sq. ft. floor space, with yard area to take in entire block.

Pittsburgh

PITTSBURGH, March 3.—Although orders for machine tools with some dealers were larger in February than in January, the aggregate business so far this year is considerably behind the total for the same period in 1929. There is also little consistency in the general situation, some dealers receiving a fair number of orders and others getting little or no business. However, the volume of new inquiry is improving and the placing of half the tools on which bids are now being taken would assure a good volume of business in March.

The major development of the week is the Pennsylvania Railroad's inquiry for a number of tools. Although no definite list has been issued, there is every possibility that more tools will follow the present inquiry. Other railroads are still inactive, the only one which has been a buyer in even a small way this year being the Baltimore & Ohio. The Westinghouse Electric & Mfg. Co. is still buying against its first quarter list, which will soon be exhausted.

City Ice & Fuel Co., 6611 Euclid Avenue, Cleveland, is planning for multi-story ice-manufacturing, cold storage and refrigerating plant to occupy entire block at Pittsburgh, to cost about $2,000,000 with machinery. Ice-manufacturing division will have capacity of about 300 tons a day. Company is now operating six plants in Pittsburgh district.

Pennsylvania Power Co., Sharon, Pa., has plans for a new two-story equipment storage and distributing building, with service and repair departments, to cost about $100,000. Company is also planning power substation on local site to cost about $150,000. Stevens & Wood, Inc., 20 Pine Street, New York, is engineer.

General Electric Co., Schenectady, N. Y., is planning early construction of one-story addition to plant on East Lake Road, Erie, Pa., 75 x 225 ft., to cost over $130,000 with equipment.

Franklin Railway Oil Corporation, recently organized as a subsidiary of Standard Oil Co. of New York, 26 Broadway, New York, has taken over plant and business of Franklin Railway Oil Co., Franklin, Pa., with refinery in Two-Mile Run district, near city. New company plans expansion in output. John E. Ferry is vice-president and general manager.

Aluminum Co. of America, Inc., Oliver Building, Pittsburgh, has awarded contract to McClintic-Marshall Co., Oliver Building, for additional units at mill at Alcoa, Tenn., to cost over $200,000 with equipment. Company also contemplates other expansion at Alcoa plant, including a hydroelectric power development on Little Tennessee River.

Ackermann Mfg. Co., River Road, Wheeling, W. Va., manufacturer of heavy and light pressed steel stampings, will soon begin work on one-story addition, 60 x 200 ft., to cost over $75,000 with equipment.

International Derrick & Equipment Co., Columbus, Ohio, has opened a sales office at 1510 Grant Building, Pittsburgh, in charge of James H. Dye as district manager.

Buffalo

BUFFALO, March 3.—Kimberly-Clark Corporation, Niagara Falls, N. Y., has plans for five-story addition to local paper mill, 85 x 200 ft., to cost $200,000 with equipment. Headquarters of company are at Neenah, Wis., where expansion will also be carried out at mill at Appleton, Wis.

Atlantic Refining Co., 260 South Broad Street, Philadelphia, is considering a new oil storage and distributing plant at Rochester, N. Y., to cost over $70,000 with equipment.

Frontier Mfg. Co., Inc., North Tonawanda, N. Y., has been formed with a capital of $500,000, to take over and expand company of same name, with local plant, for manufacture of refined oils, coal tar products, etc. Incorporators of new company include Charles E. Wirth, 15 Sweeney Parkway, North Tonawanda; and George W. Clarke, 909 Roberts Street, Niagara Falls, N. Y.

Columbia Gas & Electric Corporation, 61 Broadway, New York, operating electric power and natural gas properties, is considering construction of pipe lines near Binghamton and Olean, N. Y., for service at Port Dickinson, Bainbridge, Deposit, Sidney and other points, where franchises have been secured. Company operates Binghamton Gas Works, Binghamton.

American Tar Products Co., Union Trust Building, Pittsburgh, a subsidiary of Koppers Co., same address, has plans for one-story plant at Utica, N. Y., for production of a coal tar-crushed stone product, to cost about $65,000 with machinery.

Viking Metal Products Corporation, Jamestown, N. Y., manufacturer of interior metal trim for buildings, etc., has arranged for increase in capital from $150,000 to $500,000 for general expansion.

Detroit

DETROIT, March 3.—Electrograph Co., 725 West Grand Boulevard, Detroit, manufacturer of mechanical equipment, will soon take bids on general contract for two-story addition, to cost over $60,000 with equipment. Weston & Ellington, Stroh Building, are architects.

United States Rubber Co., 6600 East Jefferson Avenue, Detroit, manufacturer of tires, mechanical rubber goods, etc., is planning extensions and improvements in power plant, including installation of additional equipment, to cost about $50,000. A. J. Brandt Co., Woodward Avenue and Grand Boulevard, is engineer.

Bassett Foundry Co., Adrian, Mich., has been organized to take over and expand foundry division of Consolidated Concrete Machinery Co., with local plant. Iron and other metal castings will be produced and capacity increased. New company is outgrowth of Adrian Castings Co., which was merged with Consolidated company about three years ago; Isaac Bassett is president and treasurer, and W. H. Burnham, vice-president.

Board of Trustees, Michigan College of Mining and Technology, Houghton, Mich., has awarded general contract to R. J. MacLeod & Co., Builders' Exchange, Duluth, Minn., for four-story mechanical and electrical engineering building, to cost $250,000 with equipment. Derrick Hubert, Menominee, is architect.

Bundy Tubing Co., 4815 Bellevue Avenue, Detroit, manufacturer of metallic tubing, has leased three-story factory, 90 x 110 ft., on Bellevue Avenue, for expansion. Plans are under way for erection of a third unit, to cost over $70,000 with equipment.

Ford Motor Co., Detroit, has plans for new steam-operated electric power plant at River Rouge works, to cost over $700,000.

Aircraft Products Corporation of America, Inc., 743 Beaubien Street, Detroit, has merged with Holcker Mfg. Co., Kansas City, Mo., manufacturer of kindred equipment. Kansas City plant will be continued in service for gasoline and oil tank division of production, of which C. W. Holcker, formerly head of Holcker company, will be in charge. Detroit works will continue with manufacture of landing gears, wheels, struts, and other aircraft specialties. Ralph R. Irwin is president.

Board of Public Works, Holland, Mich., has plans for extensions and improvements in municipal electric light and power plant, including installation of additional equipment, to cost close to $125,000. Giffels, Hamilton & Weeber, Grand Rapids National Bank Building, Grand Rapids, are consulting engineers.

Sparks-Withington Co., Jackson, manufacturer of radio equipment, automotive products, etc., has acquired plant of Sherlock-Manning Piano Co., London, Ont., for branch works, primarily for production of radio sets and parts.

Cleveland

CLEVELAND, March 3.—Machine tool sales were light during the past week and showed gain over the previous week. However, inquiries increased somewhat. Sales by some dealers during February gained a little over January, but others did slightly less business. New inquiry is confined mostly to one or two machines and is coming from widely scattered sources. Quite a little buying is being done by motor car manufacturers or parts makers. Some makers of stampings, forgings and other automobile parts are fairly busy and others are operating plants at considerably less than capacity.

Hammond Mfg. Co., Cleveland, has placed contract for a new one-story plant, 90 x 124 ft., at 3089 East Eightieth Street.

Toledo Scale Co., Monroe Street, Toledo, Ohio, has awarded general contract to A. Bentley & Sons, Belmont Street, for a new unit to cost over $500,000 with equipment.

Superior Galvanizing Co., Cleveland, recently organized, has leased property at 3125 Croton Avenue, S. E., for production of galvanized iron specialties. E. W. Miller is head.

Union Steel Products Co., 13009 Athens Avenue, Lakewood, Ohio, is considering new one-story plant at Youngstown, Ohio, to cost over $60,000 with equipment.

Continental-Diamond Fibre Co., 1160 West Third Street, Cleveland, manufac-

turer of hard fibre products, with headquarters at Newark, Del., is considering an addition to local plant, to cost over $40,000 with equipment.

Schill Brothers Co., Crestline, Ohio, manufacturer of stoves, furnaces, etc., is considering rebuilding portion of plant destroyed by fire Feb. 25.

Nelson Machine & Mfg. Co., Cleveland, formerly located on West Twenty-fifth Street, has leased space in building at 12509 Plover Street, Lakewood, for new plant.

Wheeler Metal Products Corporation, Cleveland, manufacturer of automobile parts, has completed a $200,000 addition to its plant, quadrupling former capacity. Company now has in operation a fully equipped windshield department and has also added a rolling department. Several 350-ton Bliss presses have been installed. Detroit sales are handled by C. J. Edwards, manager, R. A. Cragin and M. T. Johnson; offices are in Fisher Building.

Machinery and raw materials of F. B. Stearns Co., 12435 Euclid Avenue, Cleveland, will be sold at public auction, April 8, 9 and 10, by Industrial Plants Corporation, 25 Church Street, New York. Company, which was engaged in manufacture of automobiles, went into voluntary liquidation by action of stockholders on Dec. 30, 1929. H. J. Leonard has been appointed liquidating agent.

Chicago

CHICAGO, March 3.—A good deal of machine tool business is pending, and if action is taken this month on a fair proportion of the inquiries, a satisfactory business will be done. Fresh requests for prices are scarce and, barring possible lists from the railroads, there are no immediate prospects of large industrial requirements appearing. The present condition of dealers' order books varies widely. Those who participated in the recent lists placed by two farm implement manufacturers will be assured fair-sized deliveries this month. On the other hand, some local dealers are entering March with little business on their books.

Buyers are finding deliveries more to their liking. Although a few machine tools cannot be had in the near future, most of them may be had promptly and stock lists of standard machines are becoming common. The Santa Fe continues to place orders against its list. The Illinois Steel Co. is asking for prices on several machine tools for its Joliet and South Works.

B. H. Bunn Co., 7329 Vincennes Avenue, Chicago, manufacturer of tying machinery, parts, etc., has awarded general contract to H. N. Samuels, 53 West Jackson Boulevard, for one-story addition, 65 x 100 ft., to cost about $40,000 with equipment. J. M. Branstetter, 2001 Pershing Road, is architect.

Mercoid Corporation, 564 West Adams Street, Chicago, manufacturer of electrical and radio equipment, has leased one and two-story plant at 4201 Belmont Avenue, totaling 90,000 sq. ft. floor space, for manufacture of electric automatic controls and kindred products.

Chicago Perforating Co., 2400 West Twenty-fourth Place, Chicago, manufacturer of perforated metals, mining screens, etc., has acquired one-story factory on adjoining site, 100 x 196 ft., for expansion.

Des Moines Electric Light Co., Des Moines, Iowa, is considering new steam-operated electric generating plant to cost over $2,000,000, including transmission system. Company engineering department, Equitable Building, is in charge; F. A. Beatty is chief electrical and mechanical engineer.

Bay State Milling Co., Winona, Minn., has plans for addition to flour mill, including elevating, conveying and other mechanical equipment, to cost about $65,000. Barnett & Record, Flour Exchange, Minneapolis, Minn., are architects.

Red Wing Model Airplane Co., 5326 North Kedzie Avenue, Chicago, has leased one-story building in course of erection at Cornelia and Knox Streets, totaling 10,500 sq. ft. floor space, for new plant to increase present production.

Great Northern Railway Co., Railroad Building, St. Paul, Minn., is contemplating new steam-operated electric power plant at Great Falls, Mont., to utilize pulverized coal as fuel, to cost over $150,000, with equipment. A similar station is planned at Havre, Mont., to cost about $100,000. J. R. W. Davis is chief engineer, address noted.

Dallas Brass & Copper Co., Chicago, has taken out a permit for a warehouse and factory, 211 x 452 ft., at 220 North Natchez Street, to cost $600,000.

Service Stamping Co., 701 East Lincoln Street, Bloomington, Ill., has been organized by William Nathanson, formerly president of Jackson Auto Radiator Co., Chicago, Joseph V. Grade and Charles P. Wiel to do automotive and general stamping work. Company is in the market for a number of presses.

Hart-Parr Tractor Co., Charles City, Iowa, has purchased an electric cupola charger from Whiting Corporation.

Reliance Mfg. Co., Massillon, Ohio, maker of Kantlink lock washers, has removed its Chicago office from Peoples Gas Building to room 1513 Straus Building. E. C. Gross is manager.

Milwaukee

MILWAUKEE, March 3.—New machine tool business is developing slowly, but the steady increase in inquiries indicates definite improvement. The automotive industries are somewhat more active, but orders from this source are relatively scarce. Nearly all machine tool builders have enough work to maintain operations at or close to capacity well into the spring, and they are looking for an active summer season. Industrial employment generally is expanding.

Wausau Iron Works, Wausau, Wis., fabricator of structural steel and builder of snow plows and other heavy-duty highway equipment, has increased its capitalization from $150,000 to $400,000. Additions to plant and equipment are contemplated.

Charles A. Gunderson, Escanaba, Mich., has organized Metal Culvert Co. and has leased former Delta County highway commission warehouse, which will be equipped for producing corrugated metal culverts for drainage. Production will start about March 15.

Twin Disc Clutch Co., 1325 Racine Street, Racine, Wis., manufacturer of automotive and industrial clutches is planning construction of a two-story addition which will require considerable equipment. Details have not been completed. W. C. Gewalt is vice-president.

Midwest Tool & Mfg. Co., Milwaukee, has been incorporated by a group of machinists to establish a shop at 115 Ferry Street, to manufacture tools, dies, jigs, fixtures, etc. Principals are Louis Kwiathowski, 922 Eleventh Avenue and Hugo Wenzel, 924 Muskego Avenue.

George Sutton, formerly of Menasha, Wis., is opening a general machine shop in former Sievert Auto Trimming Co. factory at 514 North Appleton Street, Appleton, Wis.

Cary Co., Waupaca, Wis., manufacturer of oil-burning heating equipment for domestic and industrial purposes, has started work on construction of a shop addition costing about $30,000.

Cincinnati

CINCINNATI, March 4.—Inquiries for machine tools continue unabated and feature the market in this district. On the other hand, while consumers are steadily displaying a marked interest in equipment, they are reluctant to place orders after receiving quotations. The volume of fresh bookings is still below normal, although the slight trend upward which began about two weeks ago continued last week. With unfilled orders diminishing rapidly, shipments are becoming more prompt, and production, while at a fairly good rate, has receded from the high level of last year. Foreign business is practically at a standstill.

Acme Pattern Mfg. Co., 332 North Findlay Street, Dayton, Ohio, has awarded general contract to Hillsmith & Co., Winters Bank Building, for one-story addition, 75 x 115 ft., to cost about $30,000 with equipment.

Buckeye Machine Co., Lima, Ohio, has plans for one-story wing extension, totaling about 10,000 sq. ft. floor space, to cost about $75,000 with equipment.

Aluminum Industries, Inc., 2438 Beekman Street, Cincinnati, has filed plans for two one-story additions, to cost about $100,000 including machinery.

Memphis Power & Light Co., Memphis, Tenn., has plans for a one-story addition, to cost over $85,000 with equipment, Harry B. Hunter, Union Planters' Bank Building, is architect and engineer.

Tennessee Paper Mills, Inc., Chattanooga, Tenn., is considering extensions and improvements in power plant at mill at North Chattanooga, to cost about $50,000 with equipment.

Louisville Taxicab & Transfer Co., Liberty and Ninth Streets, Louisville, has plans under way for a multi-story service, repair and garage building, 100 x 105 ft., to cost over $100,000 with equipment. D. X. Murphy & Brother, Louisville Trust Building, are architects.

Dr. Pepper Bottling Co., 401 Main Street, Dallas, Tex., plans installation of automatic bottling machinery, conveying and other mechanical handling equipment in bottling plant at Nashville, Tenn., to cost about $70,000 with equipment.

W. A. Griswold Co., Centennial Building, Nashville, Tenn., manufacturer of heaters, stoves, etc., has authorized an increase in capital from $100,000 to $300,000 for expansion.

George H. Diers, 2514 McMicken Avenue, Cincinnati, has been appointed representative in that territory for line of Modern Tool Works division of Consolidated Machine Tool Corporation of America, including stationary and rotary type

die heads, chasers, chucks and collets, stud setters, milling cutters and threading machines.

National Foundry & Furnace Co., Dayton, Ohio, has purchased plant formerly occupied by American Radiator Co., 1310 West Main Street, Springfield, Ohio, and will operate this division as Springfield Foundry Co. Machinery has been installed and operations will start this week. Charles E. Davis is general manager and George E. Boggs, superintendent.

Indiana

INDIANAPOLIS, March 3.—Fries Tool & Machine Works, 1918 East Wayne Street, Fort Wayne, has plans for a one-story machine shop, to cost about $30,000 with equipment. Guy Mahurin, Standard Building, is architect.

Northern Indiana Public Service Co., Homan Street, Hammond, has work under way on a new steam-operated electric generating plant at Michigan City, with auxiliary unit for emergency service, to cost over $1,500,000 with transmission lines. Midland Utilities Co., 122 South Michigan Avenue, Chicago, parent organization, has arranged for purchase of 200 acres at Baileytown, near Gary, as site for similar plant later.

Board of Trustees, Indiana Boys' School, Plainfield, is considering new power plant to cost over $50,000 with equipment.

Cleveland, Cincinnati, Chicago & St. Louis Railroad Co., Big Four Building, Cincinnati, is planning to rebuild part of car repair shops at Beech Grove, destroyed by fire Feb. 26.

Thomson Tool & Supply Co., Odd Fellows Building, Indianapolis, has been appointed representative in that territory of Modern Tool Works division of Consolidated Machine Tool Corporation of America for its die heads, chasers and threading machines.

Gulf States

BIRMINGHAM, March 3.—San Antonio Machine & Supply Co., 325 North Center Street, San Antonio, Tex., has asked bids on general contract for a two-story addition, to cost about $40,000 with equipment. Herbert S. Green, Alamo Bank Building, is architect; W. E. Simpson & Co., Milam Building, are engineers.

West Texas Utilities Co., Abilene, Tex., is arranging for expansion at Dalhart, Tex., and vicinity, to cost $500,000, of which about $200,000 will be used for a new ice-manufacturing plant. A new transmission line will be built.

Department of Public Utilities, City Hall, Shreveport, La., W. T. Mayo, commissioner, is asking bids until March 27 for equipment for municipal waterworks, including motor-driven centrifugal pumps, filter apparatus, tank, etc. Plans and specifications at office of J. N. Chester Engineers, Inc., Clark Building, Pittsburgh, Pa., engineer.

Valley Spraying Co., Brownsville, Tex., R. B. Creager, head, is planning establishment of new plant at Progreso, Tex., to manufacture a lime solution for citrus trees, including pumping equipment, storage and distributing tanks, etc., to cost over $40,000.

City Council, Tampa, Fla., is arranging for a municipal aeronautical program to cost over $500,000, including purchase of tract known as Drew Field, with construction of hangars, repair shop, oil storage and other units. B. Russell Shaw, 810 Olive Street, St. Louis, is consulting engineer.

Colorado Interstate Gas Co., Colorado Springs, Colo., is planning construction of a booster station at Clayton, N. M., for natural gas pipe line from Panhandle, Tex., oilfields to Denver, 400 miles. Station will cost more than $600,000 with machinery.

Markle Steel Co., 1709 Sheppard Street, Houston, Tex., will proceed with superstructure for a one-story addition to mill, 96 x 125 ft., to cost about $40,000 with equipment. Giesecke & Harris, Second National Bank Building, are architects.

Ajax Foundry Co., Anniston, Ala., is planning to rebuild part of foundry recently damaged by fire.

R. J. Cummins, Bankers' Mortgage Building, Houston, Tex., and A. C. Finn, architect, associated, same address, have asked bids on general contract for four-story and basement automobile service, repair and garage building, 100 x 175 ft., to cost over $200,000 including equipment.

Gulf States Utilities Co., Beaumont, Tex., is considering extensions in power plant at Colmesneil, Tex., including installation of additional equipment, to cost over $55,000.

Board of Trustees, Prairie View State Normal and Industrial College, Prairie View, Tex., has plans for a two-story industrial and mechanical unit, 160 x 238 ft., to cost about $200,000 with equipment. F. E. Giesecke, Second National Bank Building, Houston, Tex., is architect. Work will be carried out under direction of J. K. Walker, Agricultural and Mechanical College of Texas, College Station.

Ovens, power equipment, conveying and other machinery will be installed in new plant to be constructed by Oak Cliff Baking Co., Oak Cliff, Dallas, Tex., to cost $140,000.

St. Louis

ST. LOUIS, March 3.—F. M. Stambaugh & Sons, Inc., 4356 Maffitt Avenue, St. Louis, manufacturer of tools and mechanical equipment, has plans for a one-story machine shop, to cost more than $40,000 with equipment. S. W. Stires, 6406 Myrtle Avenue, Wellston, Mo., is architect.

Moon Motor Car Co., 4400 North Main Street, St. Louis, has acquired all assets of Ruxton automobile from New Era Motors, Inc., New York. Production of Ruxton car was begun recently at Moon plant, and increased capacity will be carried out. New interest will be known as Moon-Ruxton Co.

Western Public Service Co., Scotts Bluff, Neb., operating electric light and power utilities, including plants and system of Missouri Service Co., has arranged for a bond issue of $4,500,000, part of fund to be used for extensions and improvements.

National Garage Co., 1220 West Sixty-second Street, Kansas City, Mo., has asked bids on general contract for six-story and double basement service, repair and garage building, with foundations to carry additional stories, 115 x 156 ft., to cost over $450,000 with equipment. George E. McIntyre, Finance Building, is architect and engineer.

National Tank Co., Tulsa, Okla., manufacturer of steel tanks and other steel plate products, has plans for a one-story fabricating unit, 50 x 100 ft.

Arkansas Power & Light Co., Pine Bluff, Ark., is disposing of a bond issue of $6,000,000, part of fund to be used for general expansion in power plants and system.

Lee Tire Chain Industries, Inc., Jefferson City, Mo., is considering establishment of new plant at Sedalia, Mo., to cost about $75,000 with equipment, where operations will be concentrated in future.

Texas Empire Pipe Line Co., Tulsa, Okla., is considering construction of several pumping plants for pipe line service, to cost over $85,000 with machinery.

Mancha Storage Battery Locomotive Co., 1909 South Kingshighway, St. Louis, manufacturer of electric locomotives, is contemplating one-story addition, to cost over $65,000 with equipment.

City Council, Paragould, Ark., is considering installation of a municipal electric light and power plant, to cost over $75,000. W. A. Fuller Co., 2916 Shenandoah Avenue, St. Louis, is engineer.

Broderick & Bascom Rope Co., St. Louis, maker of wire rope and cables, has moved its offices from 801 North First Street to its new administration building, 4203 North Union Boulevard.

Jensen Brothers, Coffeyville, Kan., manufacturers of oil field pumping equipment, are erecting a new factory, 92 x 200 ft., containing 18,400 sq. ft. of floor space.

Texas & Pacific Railway is in market for a heavy-duty face and guide bar grinder.

St. Louis Southwestern Railroad has purchased a Monarch, 24 in. x 10 ft., extra-heavy-duty Timken-equipped lathe for its Pine Bluff, Ark., shops from Manning, Maxwell & Moore, Inc.

Pacific Coast

SAN FRANCISCO, Feb. 27.—Bucklein Engineering & Supply Co., 336 South San Pedro Street, Los Angeles, manufacturer of mechanical products, has awarded general contract to S. M. McMackin, 5054 Eagle Rock Boulevard, for two-story plant, 75 x 80 ft., to cost about $35,000 with equipment.

United States Refining Co., Los Angeles, has plans for an oil storage and distributing plant at Alameda, Cal., including several units, tanks, etc., to cost about $45,000 with equipment.

Crown Zellerbach Corporation, 534 Battery Street, San Francisco, operating paper and pulp mill properties, has arranged for a bond issue of $10,000,000, part of fund to be used for extensions and improvements. Crown Willamette Corporation, a subsidiary, has expansion program in progress at mill at Camas, Wash., to cost more than $1,000,000 with equipment. Louis Bloch is chairman of board.

Pacific Coast Steel Co., East Slauson Avenue, Los Angeles, has plans for one-story fabricating plant, 80 x 260 ft., for production of reinforced concrete steel bars, with part for storage and distribution. A 10-ton traveling crane will be installed. Unit will cost over $100,000 with equipment.

Union Ice Co., 354 Pine Street, San Francisco, has plans for cold storage and refrigerating plant at Santa Cruz, Cal., to cost about $50,000 with equipment.

Gilmore Oil Co., Berkeley, Cal., has plans for a new oil storage and distributing plant, to cost about $60,000 with equipment.

Department of Public Works, Spokane, Wash., Andrew J. Fabian, commissioner, has plans for a hangar with repair and reconditioning facilities at municipal air-

port, to cost about $45,000 with equipment.

Washington Gas & Electric Co., Tacoma, Wash., is arranging for a bond issue of $2,000,000, part of proceeds to be used for expansion. Company has purchased Dixie Power Co., operating at Cedar City, Utah, and vicinity, and will carry out extensions, including transmission lines.

Liquid Carbonic Corporation, 3100 South Kedzie Avenue, Chicago, manufacturer of soda fountain apparatus, bottling machinery, etc., has filed plans for a one-story plant, 147 x 240 ft., at Los Angeles, to cost about $100,000 with equipment. Austin Co. of California, 777 East Washington Street, is engineer.

Pacific States Pulp & Paper Co., Hutton Building, Spokane, Wash., is considering early construction of sulphate pulp mill at Priest River, Idaho, to cost over $1,000,000 with equipment.

Rheem Mfg. Co., 4535 Horton Street, Oakland, Cal., manufacturer of steel barrels, has purchased Western Steel Package Co., Ninety-second Avenue. Latter company was a subsidiary of Niedringhaus Co., St. Louis. Plant of Western Steel Package Co. will be closed.

Canada

TORONTO, March 3.—While machine tool demand is somewhat spotty, builders and dealers are receiving a better volume of inquiry. The addition to the Peterborough plant of the Canadian General Electric Co. will require considerable equipment, and other companies are preparing lists for early closing. The automotive industry is one of the largest buyers at present, but demand from this source is mostly for replacement. The railroads are issuing small lists at regular intervals.

Canadian General Electric Co., Peterborough, Ont., is receiving bids for an addition to cost $500,000. Building will be used to manufacture switchboard equipment and will be 160 x 400 ft., with an extension 100 x 240 ft.

Trane Co. of Canada, Ltd., 439 King Street West, Toronto, will secure local factory and install equipment to manufacture concealed heaters, unit heaters, etc. Company has purchased 2½ acres at Leaside, Ont., where it will erect a plant later. Head office is at La Crosse, Wis.

Bids will be called soon by A. L. Marsolais, Joliette, Que., secretary-treasurer, for a 2500-gal. pump to cost $10,000.

Ford Co. of Canada, Ltd., is securing options on industrial areas at Vancouver, B. C., for establishment of an assembly plant.

Alberta Wood preserving Co., Calgary, Alta., proposes to build a $150,000 wood-treating plant at Swift Current, where an 80-acre site has been purchased. Construction work to be started soon.

Foreign

PLANS are under way by Tungsten Electric Corporation, a subsidiary of Eisler Electric Corporation, 730 South Thirteenth Street, Newark, N. J., manufacturer of tungsten products for establishment of plant in Europe. Dr. Clemens Laise, president, has just left for trip abroad to select site and arrange details. Initial works will cost over $150,000. Charles Eisler is head of parent organization.

United Verde Copper Co., 111 Broadway, New York, is considering new copper, lead and zinc refinery in Mexico, near boundary line of United States, below Presidio, Tex., where railroad is being built by Gulf, Colorado & Santa Fe Railway. Mill will have capacity of about 500 tons a day and will cost over $1,000,000.

Government of Finland, Helsingfors, is planning to adopt recommendations of special State committee for expansion in shipbuilding facilities, to include construction of addition to Sandvikens drydock, building of new floating drydock, mechanical and other shops for ship construction and repairs, and installation of 50-ton electric traveling crane, entire project to cost about $617,400. Majority of equipment will be purchased outside of Finland.

Libby, McNeil & Libby, Union Stock Yards, Chicago, food products, will carry out expansion at fruit canning plant at Honolulu, T. H., including construction of a new cannery unit, storage and distributing plant, and other buildings, to cost over $100,000 with machinery.

British United Shoe Machinery Co., Ltd., London, England, an interest of United Shoe Machinery Corporation, Boston, has arranged for purchase of controlling interest in Gimson Shoe Machinery Co., Ltd., London, and will consolidate with organization. Gimson factory will be expanded.

The Week's News Quickly Told

Current Events That Bear on the Course of Business

EMPLOYMENT is slowly improving after reaching a point considerably lower than in the early months of 1928, according to American Federation of Labor. The worst situation exists in the building trades, two out of five being out of work.

* * * * *

COMMODITY price index will continue depressed until the middle of the year, in the opinion of Silberling Research Corporation.

* * * * *

PAPER industry shows a distinct upturn in production and sales, S. L. Willson, president American Paper and Pulp Association, tells President Hoover.

* * * * *

RETAIL and wholesale trade continue featureless. Collections are uniformly slower than a year ago, there being a pronounced tendency to hoard resources in hand.

* * * * *

RESERVE funds for bad debts, which many corporations maintain, are exempt from income taxes only if a recapitulation showing the relation between the amount of income diverted to the fund and the amount of uncollectable accounts during the tax year is included in the returns.

* * * * *

EARNINGS of 1258 representative corporations for 1929, studied by a Chicago accounting firm, showed a 15 per cent average increase over 1928. Railroads earned 6.75 per cent above 1928; 700 industrials, 18 per cent; 91 financial institutions, 35 per cent.

* * * * *

SOVIET Russia's five-year industrial plan was 95 per cent operative for the first quarter of the fiscal year, which began Oct. 1. Transportation, coal, iron and wheat production were behind schedule . . . All citizens have been ordered to open savings accounts in Government banks, as a means of concentrating capital for use in the plan.

* * * * *

UTILITIES should be regulated by state agencies rather than by the Federal government, said Governor Roosevelt of New York, who has reorganized the State Public Service Commission and instructed its members that it is to take the initiative in demanding good service and fair rates.

* * * * *

LEIPZIG, Germany, opened its spring fair with 10,000 exhibits, of which 100 or more were from United States. American companies are represented by 3000 buyers. Major American exhibts are time and labor saving and mass production devices. American buyers' interests are expected to be toys, novelties, glass ware, ceramics, chemicals and optical goods.

* * * * *

AMERICAN CAN CO. has accepted stock in British Can Co. in exchange for right to use American patents and sealing process in Great Britain.

* * * * *

CHICAGO industrialists have formed a company to manufacture wall board from corn stalks . . . State of Iowa has conducted experiments on a semi-commercial basis for five years to determine the value of the corn stalks for wall board and other uses.

* * * * *

PRESENT pay load of commercial aviation lines is less than 40 per cent of the capacity of the ships in use . . . The Postmaster General has proposed a pound-mile basis for air mail contracts to replace the present system . . . A 200 mile per hr. plane for war use has undergone extended tests by army flyers.

* * * * *

THE legality of "double taxation" laws applying to subsidiaries of foreign companies operating in France is being tested in the case of the Boston Blacking Co., which had been appealed to the French Supreme Court . . . Standard Oil Co. of New Jersey, Gulf Oil Co. and Atlantic Refining Co. have applied to the French Government for permission to erect a cooperative refinery to serve the French markets.

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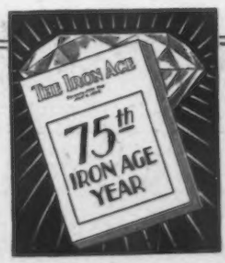

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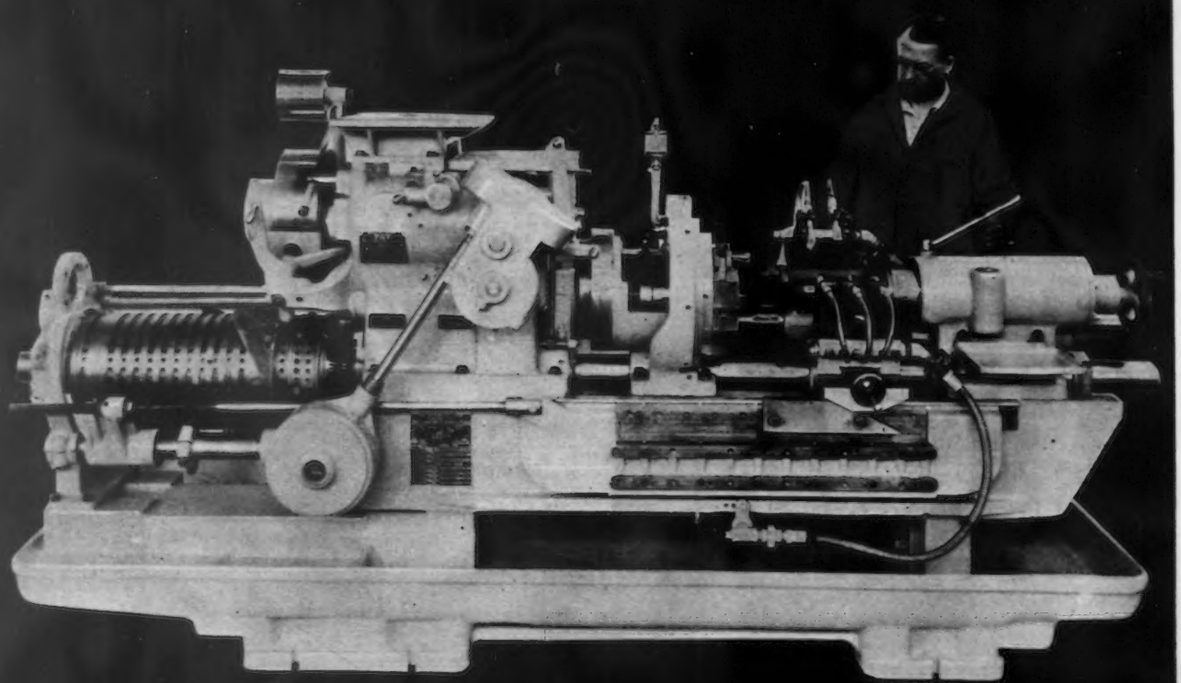

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